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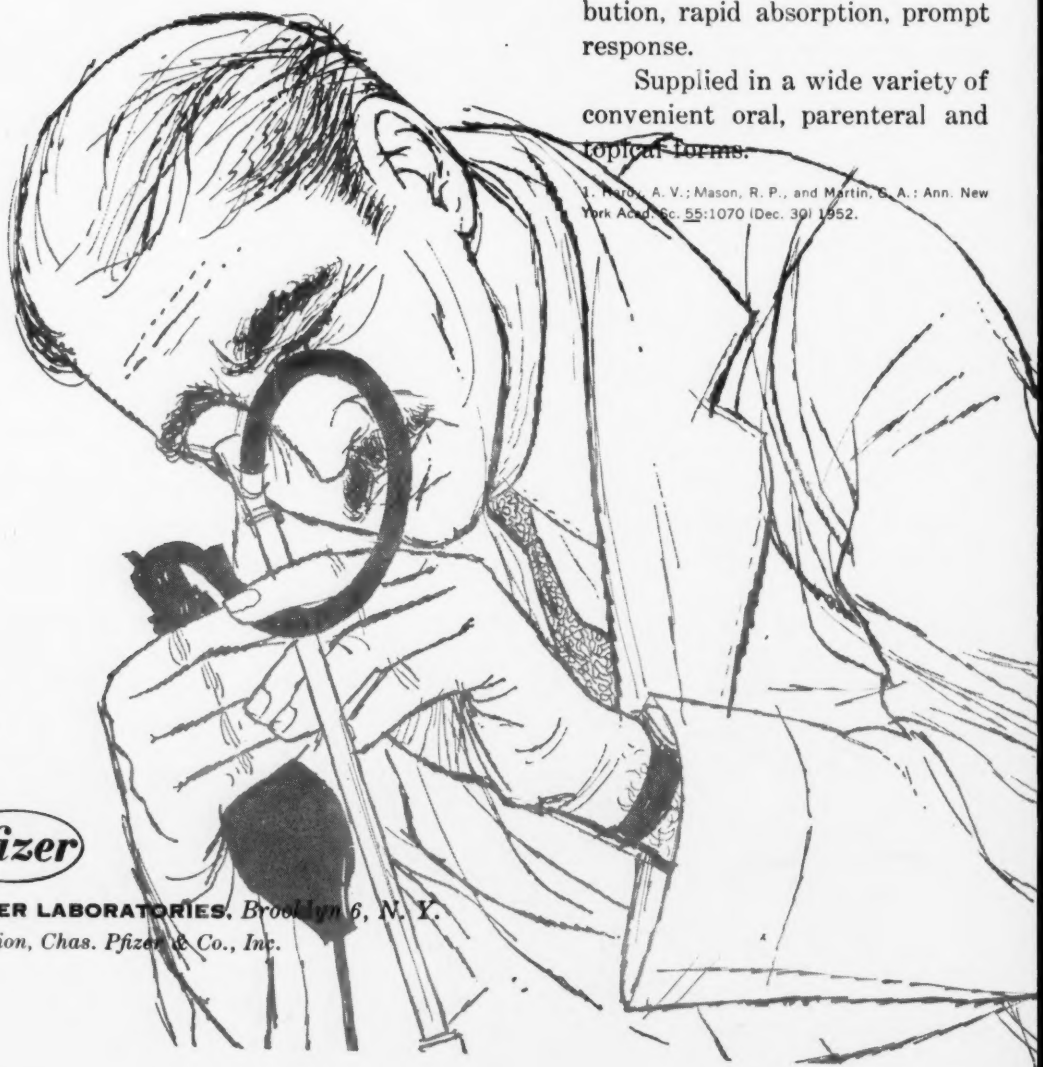

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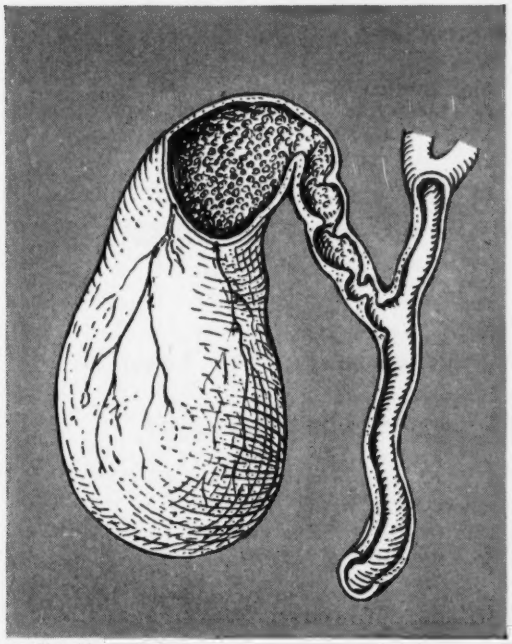

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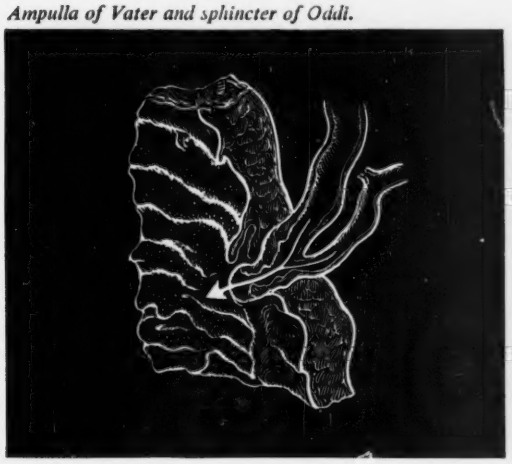

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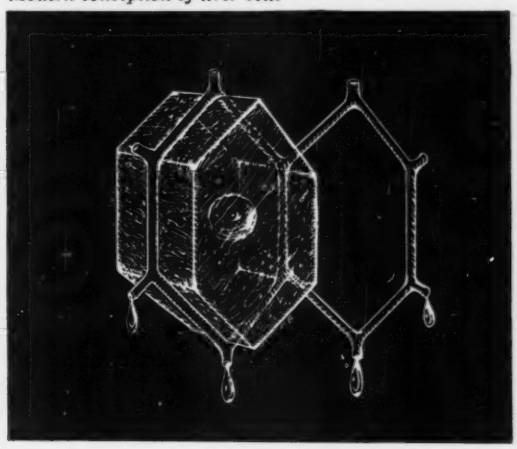

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THE American Journal OF Gastroenterology

(FORMERLY THE REVIEW OF GASTROENTEROLOGY)

The Pioneer Journal of Gastroenterology, Proctology and Allied Subjects in the United States and Canada

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THE American Journal OF Gastroenterology

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RESTORATION OF ESOPHAGOINTESTINAL CONTINUITY AFTER TOTAL GASTRECTOMY: PHYSIOLOGIC ASPECTS*

WILLIAM P. MIKKELSEN M.D.
Los Angeles, Calif.

This presentation deals with the effect of various operative maneuvers on the physiologic consequences of total gastrectomy. From the standpoint of mortality statistics alone, total gastrectomy is no longer a feared operation[1,8,15-17,23,35,39]. It is indeed advocated by many as the elective procedure of choice for malignant lesions of the stomach[1,8,17,19]. Consequently, greater numbers of patients are being subjected to this procedure. Not all of these patients are pleased with their operation, in spite of the fact that their original disease may have been eradicated. Their postgastrectomy symptoms at times may be incapacitating. In view of the high percentage of these invalided patients, many surgeons view the prospect of total gastrectomy with reluctance. The patient who cannot eat without distress, who experiences much difficulty in maintaining weight, who has annoying borborygmi with explosive diarrhea, who experiences disturbing symptoms of esophagitis or who slowly starves to death cannot be considered a surgical success. It would seem reasonable that many of these patients, had they had foresight, would have refused surgery.

It has not yet been conclusively proved that total extirpation of the stomach is oncologically correct for cancer of the stomach, that is that it yields a significantly greater percentage of cures than subtotal resection. This factor remains for the future to tell us. Nevertheless, it behooves us in the meantime, to strive for technical methods of improvement for these patients. Regardless of the particular surgeon's viewpoint of the operation he will be occasionally presented with a lesion that demands total gastrectomy.

This discussion is primarily concerned with the nutritional problems encountered in these totally gastrectomized patients. The bulk of the literature dealing with nutritional problems following gastric operations relate to subtotal

*Read before the Eighteenth Annual Convention of the National Gastroenterological Association, Los Angeles, Calif., 12, 13, 14 October, 1953.

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gastrectomy[2,4,12,21,25,29,37,41,42]. Whereas these difficulties recognizably are less common and usually less severe than after total gastrectomy, they nevertheless have much in common regarding their etiology. Thus a study of the two is advantageous. Understandably, the causes of difficulty in the patient with a subtotal gastrectomy when applied to the patient with a total gastrectomy become magnified.

To sufficiently appreciate why these patients have their nutritional and digestive tract problems consideration first should be given to those normal digestive processes which are directly involved. The stomach, while admittedly a dispensible organ, has very definite and important functions that are impaired or destroyed by gastric surgery. These gastric functions which are pertinent to our discussion are concerned with the alteration of ingested foodstuffs. Because of its remarkable vascularity and secretory ability, the stomach is able to regulate the temperature and correct the hpyer- or hypotonicity of ingested material. Its size and distensibility allows it to serve as a reservoir. Its thick and muscular wall and strong contraction waves enables it to triturate, and it initiates the process of enzymatic digestion. At the two extremes of the stomach are two important valves. While the stomach contents are being churned and digested, the upper of these valves prevents regurgitation into the esophagus. With antral systole the distal valve relaxes intermittently to allow the passage of small jets of this prepared chyme into the duodenum. Thus the stomach prepares the ingested food for the small bowel and delivers it in a correct fashion. Or, to elaborate, the small bowel is accustomed to handling only material that has been warmed or cooled, triturated to smaller particles, made isotonic, partially digested and delivered in small amounts.

Digestion and absorption of the chyme once within the small bowel are dependent on several factors. The significant ones are the character of the chyme, the bulk of the chyme, the supply and adequate mixing of pancreatic, hepatic and intestinal secretions with the chyme and the available absorptive area of small bowel. The mechanism of proper chyme production and its release into the duodenum have been described. Once into the small bowel, chyme stimulates the release of bile and pancreatic and intestinal enzymes of which the pancreatic enzymes are probably the most important. This is accomplished through the production of the hormones secretin and, to a lesser extent, pancreozymin. The effect of sympathetic and parasympathetic impulses on pancreatic enzyme secretion are recognized. These effects, however, are not pertinent here, since, in general, there is no technical way to modify them. Secretin production is greatest in the duodenum and steadily decreases as lower levels of the small bowel is reached. Its production is fully 50 times as great in the duodenum as in the terminal ileum. Succus entericus also finds its greatest concentration in the duodenum.

Thus properly prepared chyme, released through the pylorus into the duodenum in small amounts, is in a position to stimulate the greatest degree of

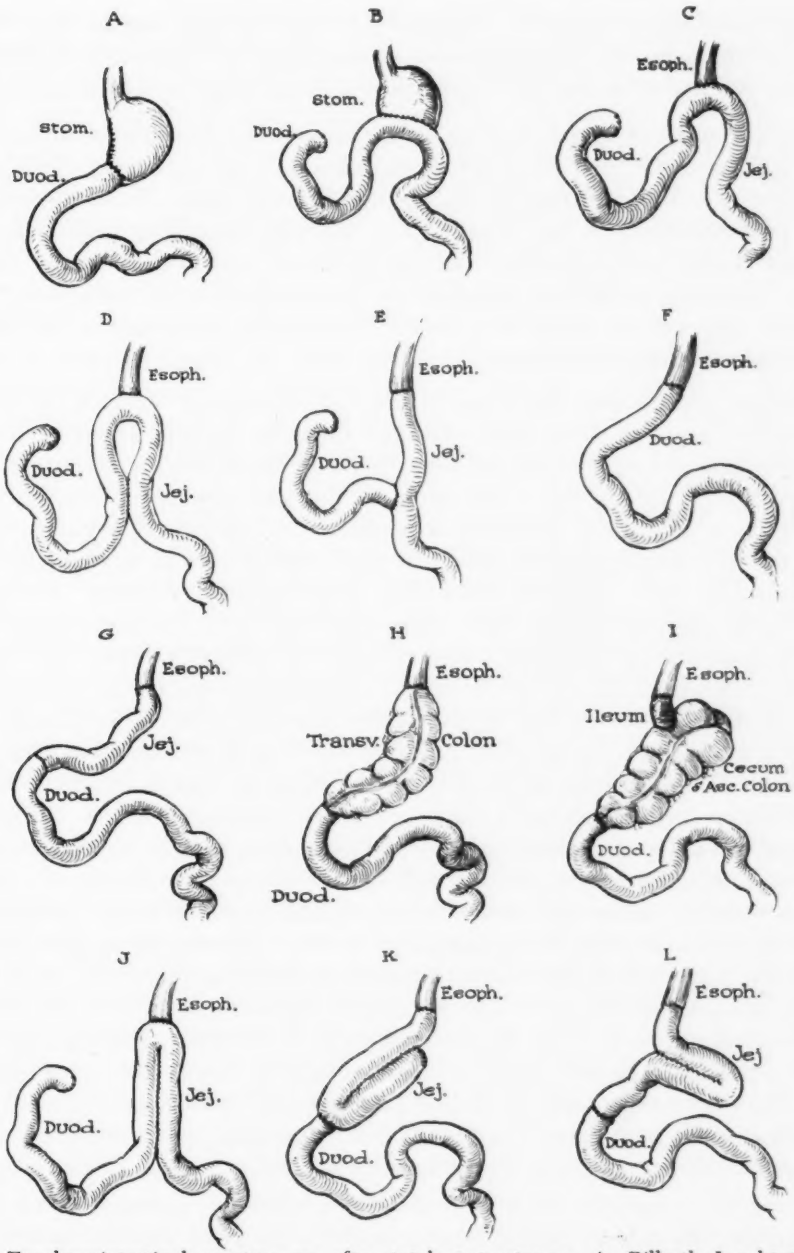

Fig. 1—Esophagointestinal anastomoses after total gastrectomy. A. Billroth I subtotal gastrectomy, B. Billroth II subtotal gastrectomy, C. loop esophagojejunostomy, D. loop esophagojejunostomy with jejunojejunostomy, E. Roux-en-Y esophagojejunostomy, F. esophagoduodenostomy, G. esophagojejunoduodenostomy, H. esophagocoloduodenostomy, I. esophagoileocoloduodenostomy, J. esophagojejunostomy with jejunojejunostomy to form pouch, K. esophagojejunoduodenostomy with jejunojejunostomy to form pouch, L. esophagojejunoduodenostomy with lateral jejunojejunostomy to to form pouch.

enzyme secretion, to stimulate a normal rate of peristalsis, and be thus exposed to the greatest effective absorptive area of small bowel. Digestion and absorption are thus maximal in the normal organism with an intact gastrointestinal apparatus.

Following most gastric operations the above intact gastrointestinal tract is altered in some fashion and normal digestion is interfered with. On the type of gastric operation will depend the degree of interference. Thus a pyloroplasty or gastroenterostomy is not usually of a sufficient disturbing nature to impair nutrition. Each destroys pyloric function, however, and is occasionally followed by the "dumping syndrome". Removal of greater portions of the stomach to its complete removal will result in a successively greater incidence of malnutrition and gastrointestinal disturbances.

Before considering total gastrectomy it is relevant to look at subtotal gastrectomy and see how these patients fare. To do this the two standard operative procedures, namely the Billroth I and the Billroth II, must be differentiated (Figs. 1a and b). The latter of the two enjoys by far the greater popularity. A Billroth II operation as done today removes two-thirds to three-fourths of the stomach and its stump is anastomosed to a loop of jejunum. The duodenum is thus excluded from the gastrointestinal current. The gastrojejunostomy stoma is usually rather large and only rarely acts as a physiological valve. Ingested food thus enters the stomach and almost immediately is passed into the jejunum. Much of the reservoir, triturating, digesting and temperature and tonicity regulatory effect of the stomach is lost. This bulk of unprepared chyme is thrust upon the jejunum, an organ not accustomed to such. This hypertonic and irritating material stimulates increased intestinal secretion into the jejunal lumen further increasing the total bulk of material involved. The jejunum becomes distended and peristalsis is increased. The material is rather quickly forced through the length of the small bowel. Stimulation of jejunal and ileal mucosa yields a rather deficient secretin production which in turn yields a deficient secretion of bile and pancreatic enzymes. Furthermore, the bile and pancreatic juice thus secreted must traverse a variable segment of small bowel before they can make contact with the chyme. In their passage variable amounts are absorbed and lost to the general economy of nutrition. A similar fate exists for the intestinal enzymes. When contact of enzymes and ingested material is made, the chyme is in a state not suited for easy and immediate digestion. Total absorptive small bowel area is reduced. Thus foodstuffs pass out of the gastrointestinal tract incompletely digested and absorbed.

Of these foodstuffs, fat is the most difficult for the gastrectomized patient to assimilate. Its determination, consequently, is the most sensitive indicator we have of abnormal digestion. Impairment of protein digestion is moderate while carbohydrate assimilation seems not to be disturbed[41,42].

It is consequently understandable that closely followed series of subtotal gastrectomies demonstrate rather high percentages of patients that have postoperative nutritional problems. Inability to gain weight is perhaps the most

common and is recorded in from 20 to 50 per cent of patients[2,3,12,21,25,27,41,42]. Not uncommonly failure to even maintain weight is seen. Distressing postprandial symptoms referred to as "dumping syndrome" occurs in 10 to 40 per cent of patients depending on the criteria used for its determination[2,12,21,25-27,29].

A study of fecal fat excretion reveals that nearly all patients following subtotal gastrectomy will lose excess fat when fed a high fat diet[41,42]. The loss in the majority is not great but does demonstrate a fundamental nutritional disturbance. Those patients who lose considerable fat in their stools are usually the ones that complain of nutritional problems thus demonstrating the correlation between fat loss and digestive problems[41,42].

When partial gastrectomy was first performed an anastomosis was made between the gastric stump and the duodenum. Abandonment of this procedure took place because of difficulty with the duodenum in cases of duodenal ulcer, a high incidence of suture-line leak at the "critical angle" and the rather frequent occurrence of stenosis of the anastomosis. The various modifications of the Billroth II operation therefore developed and the Billroth I was almost forgotten. In line with the present improvement in surgical technic, suture-line leak and anastomotic stenosis should no longer be a problem. Difficulties with mobilization and dissection of the duodenum in cases of duodenal ulcer remain, but the terminolateral gastroduodenal anastomotic modification (von-Haberer-Finney) allows such an anastomosis in most cases. The criticism that the Billroth I operation does not allow a sufficient extent of gastrectomy merits consideration. This may be true in certain cases but recent reports stress the absence of such difficulty if sufficient mobilization of the gastric stump and duodenum is carried out[6,26,33,43].

Re-evaluation of the popular Billroth II operation seems warranted. The concept that nutrition would be improved and troubling dumping would be minimized by reconstituting gastrointestinal continuity in as normal a manner as possible appears reasonable. In this manner duodenal exclusion would be eliminated and this maneuver alone could play an important part in improving nutrition. Ingested material would now pass through the doudenum and maximal stimulation of bile and pancreatic enzymes as well as succus entericus would be afforded. A greater length of small bowel absorptive area and better mixing of foodstuffs with enzymes would be obtained. An additional beneficial factor is that the gastric stump with a gastroduodenal anastomosis usually empties slower than one with a gastrojejunal anastomosis[2]. Slower emptying of this gastric pouch would diminish the bulk of material that must be handled by the small bowel at one time. It would diminish the sudden small bowel distention that is responsible for much of the postprandial discomfort of these patients.

Re-establishment of gastroduodenal continuity after subtotal gastrectomy has recently received considerable attention[4,6,10,26,29,33,43]. Several of these reports deal with the noticeable improvement in general nutrition and the relative freedom from severe dumping. Criteria for diagnosis of dumping vary in different

centers, but there is uniformity of opinion that severe, incapacitating dumping is rare following Billroth I operations[4,10,26,33]. Indeed, re-operation with establishment of gastroduodenal continuity is being employed successfully as a method of treatment for severe dumping after Billroth II operations[2,29,38]. Fat excretion studies support the superiority of Billroth I over Billroth II operations in enhancing fat alimentation[42]. The conclusion that gastroduodenal continuity should be preserved whenever possible seems warranted.

Nutrition after total gastrectomy is notoriously poor[5,8,11-13,15,17,20,23,35,39]. So few of these patients actually do well that it has almost been accepted that poor nutrition and digestive complaints are necessary sequelae to this operation. True, an occasional patient fares quite well. This fact only emphasizes that there are rather great differences among various individuals in the ability of their intestinal tract to compensate following gastrectomy. It further demonstrates the inherent differences in vasomotor and psychic stability that exist in individuals, which probably play an important part in postgastrectomy symptoms. Admittedly, most totally gastrectomized patients have had their operation for cancer and in their follow-up studies it is frequently difficult to evaluate the residual cancer factor. Patients who have had total gastrectomy for benign lesions usually fare better[1,7,12,17,35,40].

Nearly all studies on fat assimilation following total gastrectomy demonstrate a considerable degree of steatorrhea[42], consistently much greater than that observed after subtotal gastrectomy. Protein nutrition is likewise more appreciably disturbed[42]. Restoration of continuity following total gastrectomy has in the main been a loop-type esophagojejunostomy (Fig. 1c). All available nutrition studies both in animals and in humans have been carried out following this type of anastomosis. Clinically, the addition of a short enteroanastomosis or the Roux-en-Y principle has been of no appreciable benefit with regard to nutrition (Figs. 1d and e).

If we accept the apparent superiority that a Billroth I enjoys over a Billroth II subtotal gastrectomy, it would seem wise to transfer this principle to total gastrectomy, that is, to re-establish esophagoduodenal continuity. Direct esophagoduodenostomy (Fig. 1f) is applicable in only a small percentage of patients that are anatomically so constructed and its use by necessity limits the amount of esophagus and duodenum that should be resected. Furthermore, the problem of reflux esophagitis is as troublesome with this anastomosis as it is with the loop esophagojejunostomy. To preserve esophagoduodenal continuity and yet to minimize the problem of esophagitis we have, during the past two years, utilized a free segment of jejunum or transverse colon interposed between esophagus and duodenum (Figs. 1g and h). Whether this segment is utilized in an iso- or antiperistaltic direction seems not to matter.

The creation of a pouch or reservoir in some manner is probably desirable. The use of terminal ileum, cecum and ascending colon[18] seems too formidable a procedure in many cases and the possibility of vascular torsion and gangrene

is appreciable (Fig. 1i). It had been hoped originally that the transverse colon segment would dilate and serve as a reservoir. This has taken place, but it has proved to be temporary. Within two to four months after operation the transverse

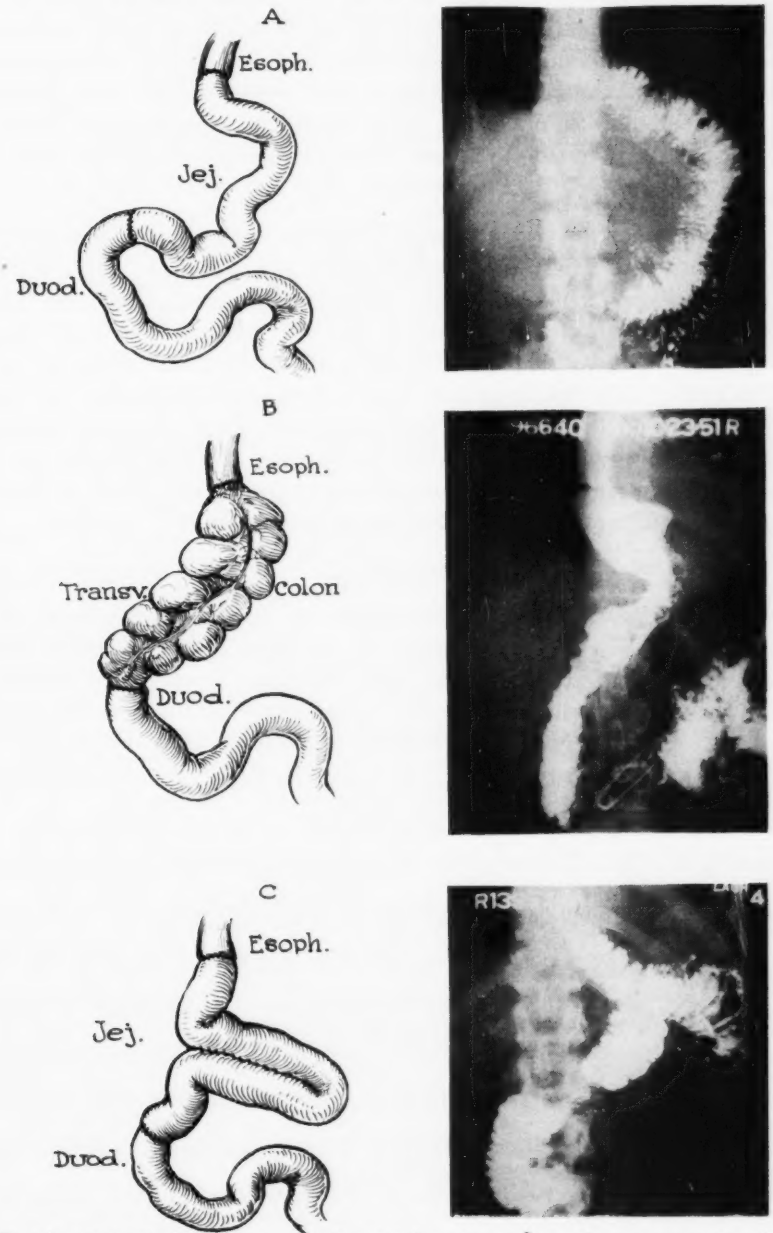

Fig. 2—Esophagointestinal anastomoses after total gastrectomy with accompanying illustrative x-rays. A. Esophagojejunoduodenostomy, B. esophagocoloduodenostomy, C. esophagojejunoduodenostomy with lateral jejunojejunostomy to form pouch.

colon has contracted and assumed a tubular structure and function. The creation of a pouch in the jejunum has been accomplished both in the routine loop esophagojejunostomy and in the free jejunal segment by performing a long side-to-side jejunojejunostomy[5,11,15]. When such an enteroanastomosis encroaches on the esophageal or duodenal end-anastomosis as it does in some methods[11,35,37] (Figs. 1j and k), it has the undesirable feature of denuding a small anterior area of jejunum of maximal blood supply and gangrene of this segment has occurred[35]. A method of obviating this problem of unsatisfactory blood supply is by creating a side-to-side anastomosis in the midportion of the free segment of jejunum thus forming a lateral pouch (Fig. 1).

At the present writing we are employing three methods of restoring esophagoduodenal continuity. These are exemplified in the accompanying diagrams and x-rays of patients so treated (Fig. 2). We are unprepared at this time to present complete follow-up studies on all of our patients. Clinically, they are supporting our original hypothesis and gratifyingly are faring better than our previous patients who had had duodenal exclusion anastomoses. A limited number of fat excretion studies on these patients have supported their clinical appearance and explained their ability to maintain and gain weight. Truly, many are not free from digestive complaints but the magnitude of these complaints is considerably less than we had previously been accustomed to expect.

Summary

Nutrition following total gastrectomy is universally recognized to be notoriously poor. The esophagointestinal anastomosis performed in the great majority of these patients has been one which has diverted the gastroinestinal current from the duodenum. Evidence is presented to suggest that elimination of duodenal exclusion may benefit these patients. The recommended manner in which this may be accomplished is demonstrated with drawings and x-rays.

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Discussion

Dr. R. John F. Renshaw (Santa Ana, Calif.):—At this late hour I am going to make my comments brief.

Because total gastrectomy is being done more frequently for malignant lesions of the stomach, we as internists and roentgenologists must face the problem and be thoroughly familiar with it.

It was not in the scope of Dr. Mikkelsen's paper to discuss some of the technical aspects of the operation. I think it is pertinent, however, that we should consider some technical aspects, particularly the mortality rate. In the first part of his paper he commented that the mortality risk was no longer to be feared. I would remind you that the mortality figure stands at 9.4 per cent in the hands of skilled surgeons working in a single institution with well-trained surgical teams. At the other end of the scale is a recent report in the *Journal of the American Medical Association* summarizing the experience of eight very well qualified surgeons operating in different hospitals under various conditions. This group performed twenty-four gastrectomies, seventeen of which were done for malignant lesions, and seven for what proved to be benign lesions. Of the seventeen operated upon for malignant lesions, seven patients died postoperatively in the hospital. Of the seven patients who proved to have benign lesions, five died in the hospital. It has not yet been shown that total gastrectomy is superior to partial or subtotal gastrectomy in percentage of long term cures. Therefore, we should ask ourselves the question, "Am I justified in submitting this patient to a greater surgical mortality risk even though I am dealing with a serious disease?" I think there is another very important point. Five of the group of seven who had benign lesions went to surgery with the preoperative diagnosis of malignant disease. Therefore, I think it behooves us to exhaust all our diagnostic possibilities and ask ourselves the question, "Am I sure this patient has malignant disease of the stomach?" before we decide that total gastrectomy as the procedure of choice for a particular patient.

Dr. Mikkelsen has talked about the physiology after operation and the "dumping syndrome". I am not so sure but that we will still see this syndrome after total gastrectomy. I hope that Dr. Mikkelsen and his colleagues will definitely define their criteria for the dumping syndrome because the criteria varies from center to center, and by the same token, the percentage of frequency varies. The usually accepted figure is about 30 per cent. In the book "Peptic Ulcer", edited by Dr. Sandweiss, you will find the statement that the dumping syndrome occurs almost as frequently after simple posterior gastroenterostomy as after subtotal gastric resection. Further on in the same book, there is a statement by Dr. Wangensteen that the Billroth I operation has not been proved to

have lesser frequency of the dumping syndrome than the Billroth II plan of gastric resection.

I am curious to know why these patients developed steatorrhea and loss of weight after total or subtotal gastric resection. I do not think it is simply a matter of rapid transit time. I wonder if it might not be a combination of quickened transit time and the irritating effect of the hypertonic food mixture with resulting inflammation of the intestinal mucosa and defects in absorption. It may be comparable to that which we observe in gastrocolic fistula. A few years ago my colleagues and I at the Cleveland Clinic were intrigued by statements that patients suffering with gastrocolic or gastrojejunocolic fistulae lost weight and developed diarrhea because of a shunt from the stomach into the colon. Drs. Templeton, Kiskaddon and I performed a series of operations on dogs making gastrocolic or gastrojejunocolic fistulae. We were able to show that, regardless of the size of the fistula opening, the bulk of the barium meal in most instances passed from the stomach, through the pylorus, into the small intestine. Only occasionally did it go directly into the colon. We were further able to show that, as the barium passed normally through the small intestine and colon, the meal was regurgitated into the stomach when it reached the fistula opening. The admixture of fecal material and gastric contents then passed down the small intestine again, eventually producing histological evidence of mucosal cell damage. I hope Dr. Mikkelsen and his colleagues will have the opportunity of doing absorption studies and observing any changes in gastrointestinal cellular physiology at it affects nutrition.

In closing, I wish to commend Dr. Mikkelsen for his excellent work and to encourage him to continue to seek some method that will improve the curability of malignant disease of the stomach.

Dr. William P. Mikkelsen (*Los Angeles, Calif.*):—I close by agreeing with Dr. Renshaw that total gastrectomy is not an operation to be undertaken lightly. If technically possible a curative subtotal gastrectomy is to be preferred. Especially do I believe that an obviously palliative resection should be subtotal.

Admittedly some statistics do seem to indicate that the dumping syndrome is as common after Billroth I operations as after Billroth II operations. It seems as well recognized, however, that severe incapacitating dumping is a rare complication of the Billroth I technic. I have been interested in the reports of Dr. Steinberg concerning his modification of the gastrojejunostomy. As I understand it, this technic should leave a small anterior portion of jejunum devoid of maximal blood supply. In a large series of cases, however, he has not noted gangrene of this area. The fact remains, however, that there are reported instances of this difficulty when this technic has been applied to total gastrectomy.

I wish to thank the discussers for their extremely pertinent remarks. In the near future I am sure that we will have the answers to some of the questions that have been raised today.

VAGOTOMY WITH PYLOROPLASTY IN THE TREATMENT OF PEPTIC ULCER – MEDICAL ASPECTS*†

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Pathophysiology and the Rationale of Vagotomy

Sufficient knowledge has now accumulated to permit a broad outline of the pathophysiology underlying the genesis of so-called "peptic" ulcer. As one scans the entire clinical material of ulcer one can detect a common denominator for all cases, namely, stress. It is not difficult to see the stress factor operating when one observes the occurrence of ulcer in cases of severe burn; in cases of severe trauma, particularly head trauma; or in the wake of other diseases such as cerebrovascular accident, brain tumor, cardiorenal failure, or malignancy. It is not nearly so apparent, unless one bothers to look, that psychological stress can be equally damaging to the organism. The response to stress in the ulcer patient has both a specific and a nonspecific character. As in all stress, the nonspecific response is mediated through the pituitary-adrenal system. We know that ACTH and cortisone can produce hyperfunction of the gastric mucosa by the increased production of hydrochloric acid and pepsin[1,2]. In addition, there have been many examples of recurrence and new formation of ulcer in patients given ACTH and cortisone. The specific response to stress of an ulcer patient is mediated through the vagus nerve. We know that in most duodenal ulcer patients there is marked hyperfunction of the gastric mucosa leading to high rates of secretion of hydrochloric acid and pepsin, and that this hyperfunction is markedly reduced by complete vagotomy. In addition, our experience has shown that when the vagotomy is complete, ulcer does not recur[3]. That this vagal response of ulcer patients is highly specific, is also supported by the study of Little[4] at our hospital in which he has shown that there is very little, if any, generalized parasympathetic overactivity in these patients. Recently Dragstedt[5] has emphasized that the pyloric antrum is an important factor in the production of increased secretion of gastric juice. Hyperfunction of the antrum, however, cannot be an isolated, primary or spontaneous phenomenon. It is more likely that in the intact animal, hyperfunction of the antrum is dependent upon extragastric factors, namely the neurogenic or vagal, and the hormonal or pituitary-adrenal.

It is my opinion that given the proper circumstances and a severe enough degree of stress, ulcer can occur in nearly every individual. I am not at all sure that a typical personality exists for ulcer and that it antedates the entire

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ulcer episode. It is equally possible that the type of stress which induces ulcer can effect changes in the personality of otherwise "normal" persons, thereby producing personality types which look more or less alike.

The rationale of vagotomy has its support in the recognition that the primary disturbance in the ulcer patient is not in his stomach but in his brain. A more practical support for vagotomy is the experience of nonrecurrence of ulcer when the vagotomy is complete[3].

Selection of Patients

There is no difficulty in the selection of patients for definitive surgery when complications occur which are directly threatening to life. These are recurrent gross hemorrhage, recurrent perforation and obstruction. A much more difficult problem occurs in the selection of patients who have so-called intractable ulcer. Before a patient is considered intractable there must be first, objective evidence by x-ray of organic change which would be conducive to intractability and, secondly, a demonstration of failure to the most intensive kind of antiulcer therapy. The objective signs for the support of intractability are the following: an unequivocal demonstration of ulcer crater; an enlarging and deepening crater; marked deformity; partial stenosis; marked inflammatory reaction and edema around the ulcer, sometimes associated with a palpable tender mass; and penetration which is frequently heralded by continuous unremitting pain. There are certain occupational groups in which conventional medical therapy is usually a failure and surgical procedures have to be considered. These include traveling salesmen, truck drivers, and policemen.

One should be wary of selecting a patient for surgery who is unwilling to cooperate in a medical program, and who shows little objective x-ray evidence to support the diagnosis of intractable ulcer.

Postoperative Management

One of the most important factors in the successful outcome of vagotomy-pyloroplasty is the postoperative management of the patient. Barring the occasional failure of vagotomy when it is incomplete, most of the poor results of this procedure can be attributed to the complications of the vagotomy itself. If, however, all patients are kept under surveillance immediately after surgery and then periodically during the first postoperative year, these complications may not become incapacitating and seldom will they persist beyond the first postoperative year. These complications are (1) cardiospasm, (2) symptomatic gastric retention, (3) the dumping syndrome, (4) diarrhea, (5) antral gastritis. Cardiospasm is seldom troublesome, usually yields readily to simple measures such as mild sedation, ingestion of warm fluid prior to eating, or the swallowing before meals of an ounce of a 1 per cent procaine solution prepared

as a thin gel with a psyllium seed mucilloid. One must have due regard for sensitivity to procaine before using it. Symptomatic gastric retention usually can be readily controlled by a period of decompression followed by the use of small frequent meals and occasionally the added use of regulated doses of urecholine. The dumping syndrome also can be readily controlled in most patients by dietary management, namely, small frequent dry meals with a low free sugar content, the deviation of fluid ingestion to the between-meal periods, and an absolute withdrawal of the use of sugar for the treatment of the acute attacks. The diarrhea in these patients is usually controlled by similar dietary measures; in some cases, however, additional treatment is necessary. Refractory cases sometimes improve after the use of cortisone. One should, however, caution here against the use of this drug in patients who have had an incomplete vagotomy. Curiously enough some patients with diarrhea following vagotomy are also improved by the use of urecholine in regulated doses. This may indicate that perhaps part of the mechanism of diarrhea in these patients may be a loss of tone in the small intestine.

Appraisal of Results from the Medical Viewpoint

It is my own view that surgery for ulcer, whether it be vagotomy-pyloroplasty or gastric resection with or without vagotomy, cannot be expected to cure the ulcer patient. On the other hand, it is a total failure if it cannot cure the patients's ulcer and prevent its recurrence. This is an important distinction. The cure of the ulcer patient may involve far more than mere surgical procedure. It is usually far more dependent upon psychological and environmental changes. Of course, surgery may materially assist in the eventual cure of the patient, in that it may relieve him of the added stress imposed by the presence of ulcer with its attendant symptoms and complications. Some of these patients make a sufficient adjustment with or without psychiatric guidance and achieve a state of reasonably good health. On the other hand, there are some patients who, despite relief from their ulcer disease, develop mental depressions or other psychosomatic disturbances.

The most important criterion in the appraisal of results with vagotomy is whether or not it prevents recurrence. To date, our own experience[3] at the Veterans Administration Hospital in Long Beach indicates that when the vagotomy is complete, ulcers do not recur. The addition of pyloroplasty, after the technic of Wilkins[6], is preferred as a drainage procedure, simply because it leads to fewer complications than does gastroenterostomy.

I purposely have refrained from making any distinction between benign duodenal ulcer and benign gastric ulcer. The reason for it is that I believe them to be fundamentally the same. Our data indicate that vagotomy-pyloroplasty is equally effective in the treatment of benign gastric ulcer as it is in benign duodenal ulcer.

The usual procedure with benign gastric ulcer is to combine the vagotomy-pyloroplasty with conservative excision of the ulcer so that histopathologic confirmation is obtained.

In closing I should like to emphasize that surgical procedures are not substitutes for sound medical therapy, which in every instance should include whatever psychotherapy is necessary.

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VAGOTOMY WITH PYLOROPLASTY IN THE TREATMENT OF DUODENAL ULCER—SURGICAL ASPECTS*

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The purpose of this presentation is to set forth the experience of the staff of the Veterans Administration Hospital, Long Beach, Calif., with the Dragstedt operation of vagotomy combined with pyloroplasty in the treatment of duodenal ulcer. Four hundred eighty-one operations of this type have been performed by the permanent staff and advanced residents during the past five years.

Our interest was first attracted to the Dragstedt procedure by the logical reasoning upon which vagotomy is based[1]. Whatever the explanation may be for the initiation of a duodenal ulcer, it is generally agreed that its chronicity is due chiefly to the action of the acid-pepsin secreted by the stomach. Normally about 45 per cent of the secretion of the acid is mediated through the vagus nerves; another 45 per cent is mediated through the hormones liberated in the antrum of the stomach; and the remaining 10 per cent is thought to be liberated through the action of hormones from the small intestine. Under certain kinds of mental stress, the secretion which is mediated through the influence of the vagus nerves becomes greatly increased and it is this excessive secretion which is apparently responsible for the duodenal ulcer as we know it in the ulcer syndrome. If this thesis is accepted, then it is to be expected that lowering the acidity to a normal level or a level below normal by interrupting the vagus nerve supply to the stomach will be followed by the healing of the ulcer.

Because sectioning of the vagus nerves causes a marked delay in the emptying of the stomach, it is necessary to supplement vagotomy with some type of emptying procedure. If this is not done, many patients will have discomforting or even disabling symptoms of retention. It is for this reason that a concomitant pyloroplasty or some other type of drainage procedure is performed.

After a short period of use of the thoracic approach in 1946 when we first began to use the operation of vagotomy, we changed to the transabdominal approach. This was done for two reasons. First, operations performed within the thorax did not permit an inspection of the pyloroduodenal segment for confirmation of the diagnosis. Second, a gastric emptying procedure would have to be done through a separate abdominal incision.

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With our early use of the abdominal approach the operation of vagotomy was performed with the addition of gastroenterostomy. This was later changed to pyloroplasty for several important reasons. Direct continuity between the stomach and the duodenum is retained with pyloroplasty, an obvious advantage which has been emphasized recently by Harkins and his associates[2]. Also, one avoids the complication of stomal ulcer formation, a hazard which is present in gastrojejunostomy. The jejunum is poorly suited for direct contact with the gastric juices and for this reason there is a tendency for ulceration of the jejunum to occur at the site of the anastomosis, particularly if the surgeon fails to accomplish an adequate denervation. One of the principal advantages of pyloroplasty is that it permits a direct inspection of the mucosa of the pyloroduodenal canal. The importance of this direct visualization can hardly be overestimated. On several occasions we have found no evidence of scarring on the serosal surface but have found a definite ulcer of the mucosa upon opening the canal. There have been other occasions in which there was no evidence of ulcer either healed or unhealed after opening the canal and inspecting the mucosa. Whenever there is any doubt about the existence of an ulcer, either healed or unhealed, the pyloroplasty is performed first and the vagotomy is performed later if it is indicated. This avoids unnecessary operation of vagotomy in cases of mistaken diagnosis. Not the least of the advantages of pyloroplasty is the relative ease with which it is performed.

Technic

The operation of vagotomy is relatively difficult technically, but it is not particularly hazardous. The surgeon has no way of being certain at the time of surgery that an adequate interruption of the nerves has been accomplished. Because of this, one who is inexperienced in working in the region of the lower part of the mediastinum is apt to miss important components of the nerves, particularly the right nerve. This is probably the greatest difficulty encountered and is probably the reason for almost all of the failures.

The technic of vagotomy which is used in our clinic has been described in previous communications[3,4], and only a brief description will be given here. After opening the abdomen with a transverse incision at a level between the umbilicus and the xiphoid process, a large retractor especially designed for vagotomy[4] is placed to elevate the left lobe of the liver and thus expose the region of the esophageal hiatus. In our experience, better exposure of this region is obtained if the triangular ligament of the left lobe of the liver is not divided. The peritoneum overlying the hiatus is incised on a line just posterior to the branches of the inferior phrenic vessels. Caution is observed against injuring these vessels, as obscuration from bleeding at this stage may interfere with the dissection necessary for exposure of the nerves. Identification and freeing of the esophagus and the vagus nerves is done by finger dissection. The surgeon's index finger draws the esophagus into view within the abdomen, and the nerves are divided under direct vision.

The pyloroplasty is made on the Heineke-Mikulicz principle by converting a longitudinal incision in the pyloroduodenal segment into a transverse incision. The closure is made with a single row of interrupted number 50 cotton sutures placed approximately 3/16 of an inch apart. Only one row of sutures is used in making the closure. This is a safeguard against excessive infolding of the tissues which would defeat the purpose of the pyloroplasty[5]. Thus far there have been no leaks in the operations performed in this manner. If the surgeon finds that a satisfactory pyloroplasty cannot be performed because of the degree of stenosis or because of the high position of the pyloroduodenal angle, a gastoenterostomy or partial gastric resection is performed instead.

Review of a Random Group of 100 Patients With Vagotomy and Pyloroplasty

The records of 100 patients have been selected at random for this review. The indications for surgery and the results of treatment are practically the same

TABLE I

Age Incidence

Age	No. of Patients
20 - 30	13
31 - 40	32
41 - 50	18
51 - 60	26
61 - 70	8
71 - 80	3

as for those in another group selected in the same manner from the total group of patients undergoing vagotomy and pyloroplasty in our clinic. The greatest number of patients are in the age range between 30 and 60 years (Table I). We have found a higher incidence of operations for intractibility in those under 50 years of age than in those over 50. In contrast to this there is a higher incidence of the indications of obstruction and hemorrhage in the individuals over 50 than in those under 50 years of age.

The indications for vagotomy are the same as the indications for other surgical procedures in the treatment of duodenal ulcer (Table II). It finds its best application in the complications of organic obstruction, severe or recurrent bleeding and repeated perforations. It should be used reluctantly in cases which are considered to be intractable to medical management. If the principal manifestation of the ulcer complex is an emotional state which baffles the internist, then surgery will only aggravate a bad situation, and can do no more than give the internist the satisfaction of knowing that he has a surgeon to share his frustration.

Direct inspection of the duodenal mucosa at the time of surgery has given us valuable information regarding the state of the ulcer. Seventy-seven of the

100 patients in the randomized group showed an active ulcer, the degree of activity ranging from little more than an erosion to ulceration with induration and deep crater formation. Correlating the operative findings with the subsequent course, we have observed that healing occurs regularly in chronic indurated ulcers, including those which penetrate to the pancreas or liver, and it is our opinion that the more indurated and the more severe the ulcer found at operation the greater is the relief following vagotomy. This holds for severe bleeding ulcers as well. In two instances no ulceration was found within the canal and no scar was seen on the serosa of the duodenum. These two cases were considered to be errors in diagnosis, and vagotomy was not performed in either of them.

The follow-up period in this group of 100 patients varies from one to five years. One-half of the patients were followed for one to two years and the other half were followed for two to five years.

The mortality figures are reported for all of the operations of vagotomy which we have performed. There has been one surgical death in the 481 cases in which vagotomy with pyloroplasty was performed. In the total group of 800 operations of vagotomy with or without a supplemental emptying procedure, there have

TABLE II

INDICATIONS FOR SURGERY

Bleeding	40
Intractable symptoms	28
Obstruction	19
Repeated perforations	7
Question of malignancy	4
Stomal ulcer	2

been four surgical deaths. These were due to pulmonary embolism, postoperative pneumonitis, cardiac arrest, and injury to a large blood vessel.

The incidence of surgical complications and unfavorable sequelae is lower in the group with pyloroplasty than in the groups with vagotomy alone or with vagotomy and gastrojejunostomy. The addition of gastrojejunostomy has resulted in a few instances of disturbing complications including an intussusception of the jejunum into the stomach, and one instance of stomal ulcer in a patient in whom vagotomy was incomplete. There have been three instances of unsatisfactory emptying of the stomach following pyloroplasty of the Heineke-Mikulicz type. Gastrojejunostomy was added to correct the difficulty. A trial with the Finney pyloroplasty in five patients resulted in unsatisfactory emptying in three. In these three patients gastroenterostomy was performed in two and partial resection was performed in one. The fault was probably in the unsatisfactory manner in which the Finney pyloroplasty was performed rather than in any fault in the Finney operation itself when properly performed. On theoretical grounds, the Finney procedure should have a very useful place in cases of low hanging, dilated stomachs in which gravity would act against the efficient working of the Heineke-Mikulicz pyloroplasty.

In the group of 100 cases reviewed for this report, the results were satisfactory in 95 and unsatisfactory in five. "Satisfactory" means that the patient is pleased with the operation, that he is able to carry on his former occupation, that he has not had any of the complications of bleeding, obstruction, or perforation following operation and that the examining physician finds nothing to indicate that there is a recurrence or persistence of the ulcer. A large majority of the patients express great satisfaction with the operation. Some state that while they are relieved of the former pain, have had none of the complications of ulcer and have gained weight, they still have vague symptoms of nervousness, weakness, or occasional abdominal pain which is not like the pain which they experienced formerly. The five cases which are designated as failures will be discussed individually.

Patient, age 42, is classified as a failure because he states that he has not been relieved by the operation. Examination including x-ray of the gastrointestinal tract two years after operation shows evidence of a satisfactory vagotomy with healing of the ulcer. At the time this patient was considered for surgery there was considerable skepticism because of a severe emotional factor; however, the possibility of gastric malignancy could not be ruled out and surgery was decided upon, even though there was a strong possibility of persistence of his emotional symptoms following the operation.

A second patient, age 53, was operated upon because of bleeding. There was a recurrence of bleeding less than one year after his operation, with evidence of incomplete vagotomy. This patient has now been followed for two and one-half years and has had no episodes of severe bleeding since the occurrence about one year after surgery.

A third patient, age 36, was operated upon because of intractable pain. He was known to be a severe alcoholic at the time of surgery but because of the difficulties of maintaining the medical treatment, the economic factors involved and the wishes of the patient, operation was performed. At the time of his examination one year later he stated that he had not been relieved of his symptoms. The vagus nerve sectioning appeared to be complete and there was no evidence of an active ulcer.

The fourth patient, age 45, was operated upon for bleeding and had a recurrence of his bleeding nine months later. Examination showed evidence of incomplete vagotomy and a second operation was performed, this time a partial gastrectomy. An intact right vagus nerve was found at the second operation and the nerve was divided. This patient is well more than a year after his second operation.

The fifth patient, age 34, was operated upon because of bleeding. This patient expressed dissatisfaction with his operation almost from the time of the immediate postoperative period, and at the time of a follow-up examination three years later he stated that he felt worse than before the operation. There has been no

evidence of recurrence of bleeding, the vagotomy appears to be complete, and there is no evidence of persistence or recurrence of ulcer. He has several watery stools a day which is one of his chief complaints.

Summary

It is our experience that the Dragstedt procedure of vagotomy combined with pyloroplasty is an efficient method of dealing with duodenal ulcers which resist medical treatment, particularly if the indication for surgery is one of the organic complications of bleeding, obstruction, or repeated perforation. The relief expressed by the patients is impressive. Most of them state that they enjoy food for the first time in many years. Gain in weight is the common experience. The incidence of persistence or recurrence of ulceration is very low, less than five per cent in our experience. Almost all of these recurrences have been in patients in whom the vagotomy is known to have been incomplete. The surgical mortality with vagotomy and pyloroplasty is low, less than 0.5 per cent in 481 cases. The effects of vagotomy are lasting, judging from x-ray examinations and insulin tests performed as late as five years after operation. It remains to be seen whether or not the protection given by vagotomy against the persistence or recurrence of duodenal ulcer will be effective for the lifetime of the individual.

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VARIED CLINICAL MANIFESTATIONS OF CIRRHOSIS OF THE LIVER

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Since the early description of cirrhosis of the liver by Laennec, most physicians have assumed that this disease presented a fairly uniform clinical picture. Experience has shown that this is not so. The incidence of cirrhosis is increasing. Whereas previously it was seen mostly with alcoholism and malnutrition, or less commonly as a complication of cholecystitis and cholelithiasis, today there are many additional causative factors. Acute infectious hepatitis, homologous serum jaundice, sulfonamides and other hepatotoxic agents are all recognized as bearing an etiological relationship to cirrhosis of the liver, thus adding to the diagnostic problem.

Clinical Study

This study consisted of 59 unselected hospital cases. There were 35 males and 24 females; the ages ranged from 21 to 68 years. Included in this group were patients whose primary clinical picture suggested gastrointestinal malignancy, peptic ulcer with or without hemorrhage, acute and chronic gallbladder disease and obstructive jaundice. To illustrate the clinical problems encountered the following case reports are presented:

Case Reports

Case 1. Clinical syndrome suggesting malignancy of the colon:—The patient, a 58 year old white male executive, was first seen in 1947. At that time there were no complaints referable to the gastrointestinal tract. The only significant past history included a short episode of jaundice in 1927, and a moderate alcoholic intake until 1945, at which time he stopped drinking. Physical examination revealed a well-nourished and a well-developed white male with several spider telangiectases. The liver was enlarged 3 finger breadths below the costal margin, firm and non-tender; the spleen was not palpated, and there were no visible dilated lateral abdominal veins. The remainder of the examination and laboratory studies were not remarkable.

Course:—Over the next three and one-half years, until December 1950, he remained well and the size of the liver decreased so that it was just palpable

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at the costal margin. In December 1950, however, on routine examination the hemoglobin was noted to have dropped from 15.5 gm. to 11.0 gm. and the stools were guaiac positive. Complete x-ray examination of the gastrointestinal tract was normal; no esophageal varices were demonstrated. The stools continued to be intermittently guaiac positive. In April 1951, after an acute respiratory infection, the patient noted abdominal discomfort, distention, anorexia, and tarry stools. He lost 12 pounds and the liver again increased in size to 4 finger breadths below the costal margin. Liver function tests revealed evidence of hepatocellular damage, and the sedimentation rate was elevated. Another complete gastrointestinal series was performed. The stomach and duodenum were normal except for antral gastritis; no esophageal varices were demonstrated. The mucosal pattern of the ascending colon above the ileocecal valve, however, appeared irregular on the postevacuation films. The five hour film of the abdomen was reported as follows: "The medial and lateral walls of the ascending colon appeared rigid; the mucosal pattern was distorted suggestive of infiltration by a malignant neoplasm"; pressure films of the area were corroborative. Operation was performed but no neoplasm was found. There were, however, broad vascularized adhesions and enlarged blood vessels holding down and distorting the cecum and ascending colon. The portal pressure was 470 mm. of water, the liver was average-sized and cirrhotic, and the spleen was three times the normal size. Subsequently a shunt operation was suggested, but was refused. The patient went downhill slowly and finally expired after his first massive hematemesis 4 months later. Postmortem examination revealed esophageal and gastric varices, cirrhosis of the liver with several areas of benign hepatomata. The blood vessels of the portal system were enlarged.

Comment:—This case illustrates several interesting points. There was no question about the diagnosis of cirrhosis, but the clinical picture plus the x-ray findings suggested an ascending colon malignancy. At operation, however, the distortion of the mucosal pattern described on the x-ray was due to enlarged vessels of the portal system, and vascularized adhesions binding down the cecum and ascending colon. This was secondary to severe portal hypertension. Despite the bleeding from gastric and esophageal varices he never had hematemesis until the final fatal episode.

Case 2. Clinical syndrome suggesting malignancy of the pancreas or biliary tract with liver metastases or primary hepatoma:—A 48 year old married white female, was admitted to the hospital January 3, 1952, because of nausea, vomiting and upper abdominal pain of 8 months' duration, and a 20 pound weight loss. The diet was generally unsatisfactory, and she denied more than 2 or 3 whiskies a day. There was no hematemesis or melena. Systemic review and previous history were not contributory. Physical examination revealed an emaciated chronically ill white female with icterus of the skin and sclera; the tongue was red and smooth; the abdomen was distended; the liver was enlarged to 5 fingers below the costal margin; the spleen was not felt; the remainder of the physical

examination was not remarkable. Laboratory studies: RBC 3,800,000, Hb. 87 per cent, WBC 7,250, with a normal differential; sedimentation rate 83 mm. in 1 hour; glucose 140 mg. per cent; serum bilirubin 2.2. mg. per cent; alkaline phosphatase 15.2 Bodansky units; diastase 97 units; total cholesterol 280 mg. per cent; free 126 mg. per cent (40.5 per cent), esters 154 mg. per cent; cephalin flocculation negative; thymol turbidity 3; total protein 8.1 gm.; A/G ratio 5.4/2.7; Bromsulfalein 42 per cent retention; the urinanalysis was negative.

Course:—The patient looked seriously ill and ran fever up to 102°F. X-ray of the chest, a gastrointestinal series and a barium clysma were negative. The gallbladder series revealed no shadow. It was felt that the patient had a malignancy of the liver superimposed on cirrhosis, the latter proven by needle biopsy, with the primary site of the malignancy being of pancreatic, biliary or hepatic origin. She was therefore explored on January 25, 1952. No malignancy was found, but she had a finely nodular liver and ascites. The postoperative course was uneventful, and rapid clinical recovery followed. The laboratory studies showed a marked decrease in the alkaline phosphatase and serum bilirubin to normal levels; the cephalin flocculation test, however, rose to 3+, and the thymol turbidity from 3 to 8 units at the time of discharge.

Comment:—This patient presented the problem of differentiating malignant disease of the liver superimposed on cirrhosis, from cirrhosis alone. The clinical picture of abdominal pain, irregular fever, weight loss, and anorexia and the laboratory findings of high alkaline phosphatase, elevated sedimentation rate, slightly elevated serum bilirubin and marked BSP retention with a negative cephalin flocculation and thymol turbidity all suggested metastatic or primary malignant disease of the liver rather than cirrhosis alone.

Case 3. Differential problem of bleeding varices versus bleeding peptic ulcer:—A 45 year old white male waiter was admitted to the hospital on March 22, 1952, with the complaints of malaise for three months and anorexia of three weeks' duration. His dietary intake was quite adequate though he admitted to a pint of whiskey daily for about 20 years. He noted that the urine was dark in the three months prior to admission. The systemic review and previous history were noncontributory. Examination revealed a well-developed but poorly nourished adult who was icteric without spider telangiectasis. The abdomen was distended with prominent lateral abdominal veins. The liver was enlarged to 9 finger breadths below the costal margin; the spleen was not felt; there was 3+ pitting edema of the lower extremities. The remainder of the examination was not remarkable. Laboratory findings revealed a normal hemogram; sedimentation rate 127 mm. in 1 hour; urine 4+ bile, cephalin flocculation 4+; serum protein 6.5 gm.; A/G ratio 2.9/3.6, alkaline phosphatase 8.5 Bodansky units; serum bilirubin 8.1 mg.; cholesterol total 260 mg. per cent; free 228 mg. per cent (84.7 per cent), esters 41 mg. per cent; chest x-ray normal; gastrointestinal series revealed a duodenal deformity consistent with the diagnosis of chronic duodenal ulcer.

Course:—The patient improved on medical therapy both clinically and as judged by the liver chemistries. One month after admission he had massive melena with expected fall in the red blood cells and hemoglobin. Esophageal varices were suspected but, because of the x-ray diagnosis of duodenal deformity, bleedind from this source could not be excluded. He was considered a poor surgical risk and conservative supportive therapy was carried out. A string test was performed with a blood stain 25 inches from the lips, suggesting bleeding from the duodenum. Because of continued bleeding the patient was esophagoscoped and several small bleeding areas or varices near the entrance into the stomach were noted. He continued to have hematemesis and melena which could no longer be controlled and the patient expired. Postmortem examination revealed portal cirrhosis, esophageal varices with ulceration and splenomegaly. A duodenal ulcer was not demonstrated.

Comment:—This case illustrates the problem in the differential diagnosis as to the source of bleeding in a cirrhotic who also has x-ray evidence suggesting a duodenal ulcer. Figures describing the association of peptic ulcer and portal cirrhosis range from 1.8 per cent to 24 per cent[1]. It might reasonably be expected that cirrhosis with portal hypertension and consequent hyperemia of the gastrointestinal tract would predispose the mucous membrane of the stomach and duodenum to peptic ulceration. In addition to this local effect the nutritional deficiencies associated with cirrhosis might further reduce resistance against acid pepsin digestion. Wangensteen[2] has offered experimental evidence to demonstrate that portal hypertension abets the ulcer diathesis. The chief situation in which the coexistence of peptic ulcer and portal cirrhosis is important is in massive gastroduodenal hemorrhage, both from the point of view of diagnosis and management. Although it is usually presumed that hemorrhage occurring in the course of cirrhosis is due to rupture of an esophageal or gastric varix, in some instances it is due to peptic ulcer. In patients with known cirrhosis in whom bleeding occurs, every effort should be made to determine the presence or absence of peptic ulcer. The value of esophagoscopy at the bedside, if necessary, is recognized. The use of the Blakemore-Sengstaken balloon is valuable as a temporary aid, and may even help in the differential diagnosis.

Case 4. Simulating chronic cholecystitis:—The patient, a 62 year old white female, was admitted to the hospital in April 1947. She had a history of recurrent right upper quadrant pain for 12 years which had become worse in the 3 months prior to admission. Episodes of abdominal pain always followed ingestion of fatty foods. She had not been clinically jaundiced at any time. On admission the liver was 1½ inches below the costal margin and tenderness was noted in the right upper quadrant. The physical findings otherwise were not remarkable. The Graham test was reported as showing no shadow. The urine was negative for bile, and the blood count was within normal limits. Because of the history of repeated episodes of pain associated with fatty food ingestion, cholecystectomy was recommended. At operation the gallbladder was normal, but a finely nodular

liver, with changes typical of cirrhosis, was found and the diagnosis of Laennec's cirrhosis was confirmed by biopsy. The blood chemistries which were done postoperatively revealed the following: serum bilirubin 1.5 mg. per cent; alkaline phosphatase 5.1 units; cephalin flocculation 3+; thymol turbidity 24 units; Bromsulfalein retention 41 per cent; cholesterol 216 mg. per cent, with 28 per cent in the free form. The patient developed more marked hepatomegaly, spider angiomata, clinical icterus and ascites. She died 2½ years later in hepatic coma.

Comment:—This case illustrates the care which must be exercised in making a diagnosis of cholecystitis and subjecting such a patient to surgery. Although the clinical picture including history, physical findings and a nonfilling gallbladder are almost classical, the importance, however, of a liver profile prior to biliary surgery cannot be sufficiently stressed.

Pain in acute and chronic liver disease is seen more frequently than is generally supposed. Abdominal pain is common in the preicteric stage of hepatitis in the form of a dull ache or dragging sensation in the epigastrium or right upper quadrant. In some patients with acute onset, the pain may be so severe or unusually located as to suggest acute appendicitis, cholecystitis, perforated viscus, or when intermittent and colicky, gallstone colic. Pain has been said to be a frequent early symptom in about half of the patients with portal cirrhosis. In two-thirds of these it is located in the epigastrium, over the liver or in the right hypochondrium. Radiation of pain to the shoulder is occasionally seen. Colicky pain is not uncommon, and in view of the tendency for gallstones to develop in cirrhotic patients, it presents a difficult diagnostic problem.

Case 5. The problem of diagnosis of obstructive jaundice in a patient with chronic liver disease:—A 60 year old white male, ship-master, was admitted with a 3 month history of severe anorexia, a 50 pound weight loss, and vague epigastric discomfort relieved by cathartics and salicylates. For 2 weeks he had noted icterus of his skin with clay-colored stools and dark urine, all of which had subsided a few days prior to admission. He had a 5 year history of hepatomegaly, diagnosed by his doctor as cirrhosis, and treated by diet and vitamins. His alcoholic intake was minimal. Physical examination was negative except for moderate telangiectasis of the face, icterus of the sclerae, a slightly tender irregular liver of normal consistency, palpable 5 finger breadths below the right costal margin, and a spleen palpable 1 finger breadth below the left costal margin.

Laboratory data, including liver function tests, were more in keeping with primary obstructive jaundice than hepatocellular damage. The serum bilirubin went from 1.9 to 2.7 mg. per cent; alkaline phosphatase 33.2 units; total cholesterol 225 mg. per cent, with 46.2 per cent free; thymol turbidity 5.0; cephalin flocculation negative; A/G ratio 4.3/2.6; prothrombin time normal; Bromsulfalein retention 50 per cent. The urine was negative for bile with a normal urobilinogen content; stools were negative for blood and a blood count was normal. Pertinent

x-rays included a gastrointestinal series which showed a duodenal ulcer with a perforation in the region of the pancreas; a flat film of the abdomen revealed no evidence of opaque biliary calculi, and a Graham series done while the serum bilirubin was 2.7 mg. per cent showed a nonfilling gallbladder.

At operation the following findings were noted: the gallbladder was moderately distended containing several stones. The common duct contained a calculus and was also dilated. The duodenal cap was markedly indurated with a palpable ulcer crater, and there was a stricture of the common duct secondary to a perforated duodenal ulcer. The liver was enlarged, green-tinged and finely nodular and on biopsy revealed an acute and chronic hepatitis. Except for marked lethargy in his first 4 postoperative days, the patient had a relatively uneventful postoperative course and was discharged on his 43rd hospital day. At the time of discharge the BSP had returned to normal.

Comment:—In a patient with a 5 year history of hepatomegaly and chronic liver disease, when jaundice supervenes the first assumption would be to explain it on the basis of hepatocellular damage rather than on the basis of obstruction. Notwithstanding this patient's liver chemistries, all of which pointed mainly toward obstruction, the differential problem was still not unequivocally resolved preoperatively. It is well known that there is often quite a discrepancy between the extent of liver damage present and the abnormality reflected in the liver function tests. This point is re-emphasized here, for although biopsy from a grossly enlarged nodular liver revealed acute and chronic hepatitis, all of the liver function tests which reflect evidence of hepatocellular damage were normal.

Case 6. Problem of differentiating between hepatocellular damage and/or obstructive jaundice:—A 50 year old Japanese male was admitted with a 1 year history of progressive painless jaundice, weakness, fatigue and a 20 pound weight loss, despite a good food intake and lack of anorexia. Alcoholic intake was denied. He had no past history suggestive of gallbladder or liver disease or any other gastrointestinal symptoms. Pertinent physical findings on admission included: Marked icterus of skin and sclerae, a firm smooth non-tender liver, with an edge palpable 4 finger breadths below the right costal margin. A non-tender spleen palpable 4 finger breadths below the left costal margin, and 2+ ankle and pretibial edema were noted. X-rays included: a flat film of the abdomen which showed numerous radiopaque calculi in the gallbladder region; the gastrointestinal series was negative. Laboratory data: Hb. 10 gm.; RBC 3,200,000; serum bilirubin 11.4 mg. per cent; alkaline phosphatase 5.9 units; total cholesterol 230 mg. per cent, with 56 per cent in the free form; thymol turbidity 30.5; cephalin flocculation 4+; A/G ratio 3.3/4.4; prothrombin time 17 seconds, with a control of 12 seconds; the urine was strongly positive for bile, but no urobilinogen was demonstrated. Because of the presence of calculi and despite findings consistent with hepatocellular damage, an exploratory laparotomy was done. An enlarged nodular bluish-green liver was seen, a biopsy of which was reported as Laennec's cirrhosis. The spleen was 4 to 5 times normal size and the remainder

of the biliary tract and pancreas appeared grossly normal. Postoperatively, the patient went rapidly downhill with accumulation of ascites and increasing icterus, and he expired on his 61st hospital day.

Comment:—The problem faced by the clinician in this case was to determine whether the primary disease was (1) that of obstructive jaundice due to biliary calculi or malignancy, with secondary hepatocellular damage due to long standing obstruction, or (2) that of primary hepatocellular disease as Laennec's cirrhosis with superimposed obstructive jaundice, or (3) whether the entire picture was due to Laennec's cirrhosis. The visualization of numerous calculi in an icteric individual who had no alcoholic history or previous known liver disease warranted subjecting this patient to laparotomy.

Case 7. The problem of diagnosis of primary liver disease in a cardiac and the differential diagnosis between obstructive jaundice and hepatocellular damage:—A 63 year old white male was referred into the hospital from the cardiac clinic because of enlargement of his liver. He had arteriosclerotic heart disease and had been followed regularly in the clinic since his first visit in February 1951. His liver was first palpated in December 1951, at which time it was 2 finger breadths below the costal margin without any other signs or symptoms of congestive heart failure. He had no anorexia or weight loss. He admitted to two glasses of wine daily with a good food intake. Physical examination on admission to the hospital was negative except for slight icterus, moderate cardiac enlargement and a firm smooth non-tender liver palpable, 4 finger breadths below the right costal margin. The liver function tests were in keeping with obstructive jaundice without hepatocellular damage and were as follows: serum bilirubin 2.9 mg. per cent; alkaline phosphatase 15.4 units; total cholesterol 265, with 40.5 per cent in the free form; thymol turbidity 2.0; cephalin flocculation negative; A/G ratio 4.4/2.6; prothrombin time normal; the urine showed a trace of bile, but normal urobilinogen. Pertinent x-rays include a gastrointestinal series and a cholecystogram which were normal. Exploratory laparotomy on the patient's 10th hospital day revealed a liver which was greyish brown in appearance with a finely granular surface. Biopsy showed Laennec's cirrhosis. The remainder of the biliary tract and the pancreas were normal. Postoperatively, the patient gradually went down hill, becoming increasingly icteric and he expired on his 73rd hospital day.

This case illustrates several points, firstly, the problem which may arise in a patient with known heart disease in determining whether progressive liver enlargement is on the basis of congestive heart failure or primary liver disease. This is not always easy, despite the absence of other signs of heart failure, for as White[3] points out, in congestive heart failure the degree of portal stasis "which is manifested by an engorgement of the liver and stasis distal to the liver" is often out of proportion to the stasis in the systemic circulation. In addition to the above, previous studies of liver function tests in congestive heart failure and more recent work by Evans et al[4] reveal that 96 per cent of their patients had

increased bromsulfalein retention, 36.5 per cent had elevated thymol turbidity, 27.2 per cent had positive cephalin flocculation tests, and 26.4 per cent had an elevated serum bilirubin. Other investigators[5,6] had shown abnormalities in the alkaline phosphatase determinations. Secondly, this case illustrates the difficulties which may arise in differentiating obstructive jaundice from hepatocellular damage, despite our existing liver function tests.

There were two additional cases which came under our observation which are worthy of comment. A 56 year old male, in whom a diagnosis of a duodenal ulcer had been made, was admitted to the hospital with a severe episode of gastrointestinal bleeding. While he was known to have cirrhosis it was felt that the bleeding at this time was due to the ulcer and he was explored. At operation esophageal varices and not the duodenal ulcer were found to be the source of the bleeding.

Several days thereafter another 50 year old male, who was known to have cirrhosis of the liver and in whom no ulcer had ever been demonstrated, was admitted to the hospital. This patient had a severe attack of hematemesis; the latter was thought to be due to esophageal varices secondary to portal hypertension. All efforts to stop the bleeding were of no avail, and the patient expired. Autopsy showed that the bleeding was due to an extensive erosive gastritis.

Summary

Fifty-nine unselected hospital cases of chronic liver disease were studied; 35 were males and 24 were females, ranging in age from 21 to 68 years. It is pointed out that cirrhosis of the liver did not present a uniform picture in 20.4 per cent of the cases. Seven cases are reported in detail and two others are commented upon. The presenting clinical picture of cirrhosis of the liver may simulate gastrointestinal malignancy, gallbladder disease, obstructive jaundice or a bleeding peptic ulcer.

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CLINICAL APPLICATIONS OF HEPATIC RADIOACTIVITY SURVEYS*

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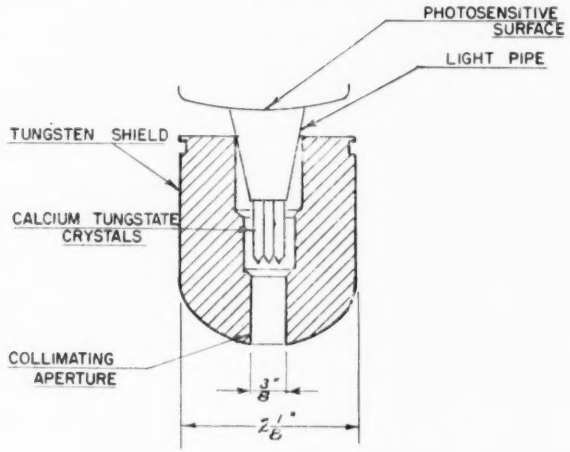
Introduction

The technic and preliminary results of the use of radioactive human serum albumin (I*HSA) for the diagnosis and localization of hepatic neoplasms has been described[1]. The method employs I*HSA as the tracer agent and a scintillation counter to detect the gamma radiation from the I^{131}. An overall diagnostic accuracy of 92 per cent was obtained by this method in a series of 283 patients. The procedure, however, was found to yield false positive results in many pa-



ARRANGEMENT OF CRYSTALS ON COARSE SCANNING TUBE

Fig. 1—Diagramatic sketch of modified scintillation counter. Note arrangement of calcium tungstate crystals.

tients with hepatitis and in patients with cirrhosis complicated by ascites. In an effort to overcome this disadvantage, experimental studies were carried out with

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tracer agents which are more selectively concentrated within the liver. These included radioactive tetraiodophenolphthalein, diiodofluorescein, and colloidal gold (Au198). Due to the high affinity of the reticulo-endothelial cells of the liver for colloidal or particulate matter[2], radiogold was found to be an efficient tracer agent for obtaining an outline for the liver. The preliminary studies in animals, using colloidal gold, were made with the conventional scintillation localizer commonly employed in thyroid scanning[3]. The results indicated that a more sensitive scintillation counter would be necessary in order to keep the dose of radioactive gold within the limits of radiologic safety for human application.

It is the purpose of this report to describe the method of hepatic radioactivity survey, employing colloidal gold (Au198) as the tracer agent and a new scintiscanner as the recorder of the gamma radiation[4,5]. The results obtained

Fig. 2—Patient in position for scanning of the liver.

with this procedure in a series of twenty-three patients are summarized, and the clinical application is discussed.

Method

The radiogold employed as the tracer agent has a physical half-life of 2.69 days and emits two soft gamma rays of 0.41 mev. and 0.12 mev., and a beta particle of 0.98 mev. The isotope is obtained as a sterile colloidal solution suitable for intravenous administration*.

The medium scanning scintilocalizer was modified by increasing the number and changing the arrangement of the calcium tungstate crystals. The collimating aperture of the tube was increased to ⅜". These modifications increase the sensitivity of the counter ten times over that of the conventional medium scanning

*Abbott Laboratories.

types with only a minimal loss of linear resolution. The prototype of this modified localizer is shown in Fig. 1†.

The procedure does not require any special preparation of the patient. A single intravenous injection of 300 microcuries of Au198 is administered. After a delay of 30 minutes to allow maximum concentration of the radiogold within the liver, the patient is positioned under the scintiscanner, as illustrated in Fig. 2. The scanning speed and counting rate are set to obtain the maximum ratio between the concentration of radioactivity within the liver area and the remainder of the body, and scanning is begun. Each complete scan of the liver requires 60 to 80 minutes. Upon completion of the scanning, the exact location of the xiphoid process, costal margins, liver edge or palpable subcostal mass is marked

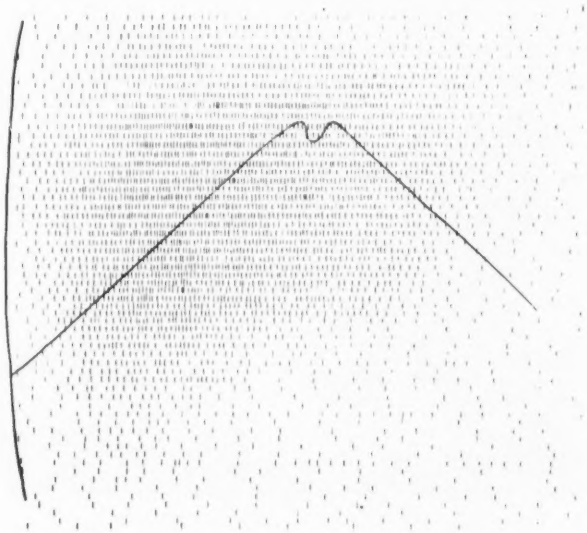

Fig. 3—Scintigram of the liver obtained in a patient with primary adenocarcinoma of the sigmoid. The liver was grossly normal at operation.

upon the scintigram for the purpose of anatomic orientation. Scanning may be repeated for as long as twenty-four hours after injection of the isotope to confirm the presence of foci of decreased radioactivity. After twenty-four hours an insufficient amount of radioactivity is present within the liver to yield a satisfactory scintigram.

The homogenous distribution of radioactivity recorded by the scintiscanner over the area occupied by normal liver parenchyma is illustrated in Fig. 3. Neoplasms, abscesses and other space-occupying lesions destroy or displace the Von Kupfer cells. Therefore foci of decreased or absent radioactivity recorded

†This tube was developed under contract No. AT-04-1-Gm-12, between the Atomic Energy Commission and the University of California at Los Angeles.

on the liver scintigram represent areas of normal liver parenchyma which have been destroyed or displaced by such space-occupying lesions.

Results

Hepatic scintigrams have been obtained in a series of twenty-three patients. Twenty-two of these patients had carcinoma of the liver proven by operation or autopsy. The other patient had been suspected of harboring metastatic hepatic carcinoma, but at subsequent operation, a large abscess occupying the right lobe of the liver was found.

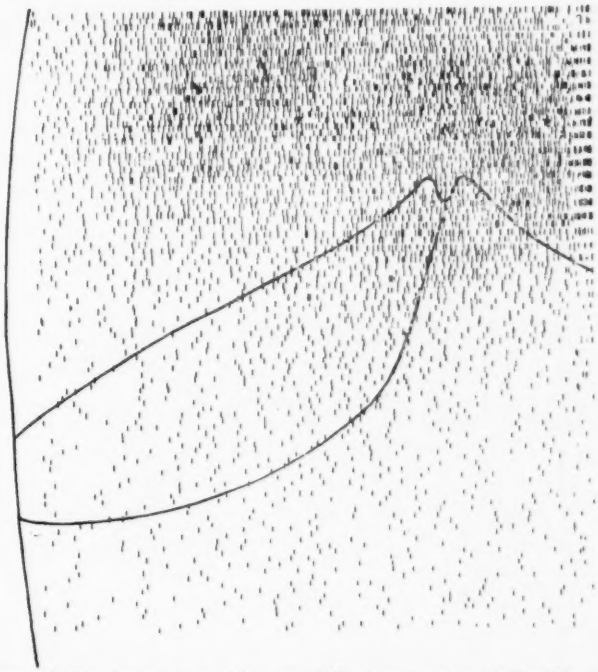

Fig. 4—Scintigram of the liver obtained with 300 microcuries of Au198. Curved line below right costal margin represents palpable liver edge. Note large area of decreased radioactivity in right lobe of liver occupied by abscess.

In nineteen of the twenty-two patients with proved metastatic carcinoma, areas of decreased radioactivity were observed on the scintigram which corresponded closely to the areas involved by the metastases. In three patients, no foci of decreased radioactivity were observed. In each of these three patients, the largest metastasis observed at operation was less than two centimeters in diameter and was not detected by scintography. In the one patient with the hepatic abscess, the scintigram accurately delineated a large space occupying lesion in the right lobe as shown in Fig. 4. The distribution of radioactivity obtained in a patient with hepatic metastases is illutrated in Fig. 5.

No discomfort or untoward reactions were noted in this series of examinations.

Discussion

The results obtained in this small series of patients confirm the findings observed in the preliminary studies on experimental animals, and establishes the practicability of hepatic scintography as a method of visually delineating space-occupying lesions of the liver. The changes in the instrumentation have permitted using small doses of radiogold. By increasing the distance between scanning lines and the width of the printing stylus by a factor of three, the time required to scan the entire liver may be further reduced to a range of 30 to 40 minutes.

Despite the short physical half-life of radiogold, the isotope has proved suitable for this application because of the high affinity of the Von Kupfer cells for

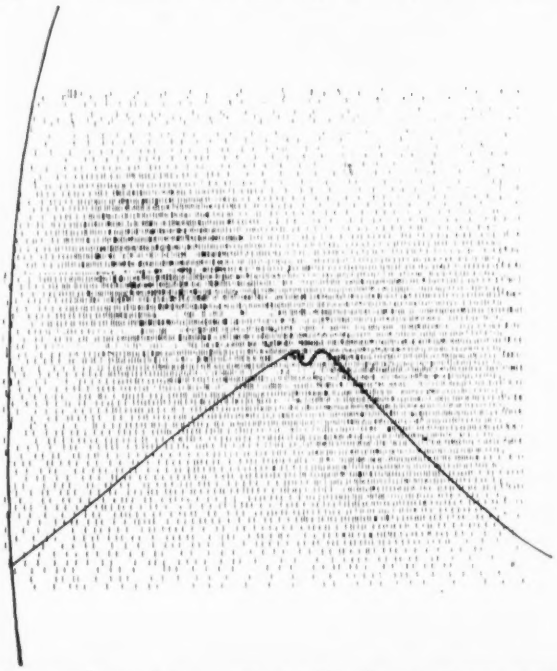

Fig. 5—Hepatic scintigram obtained in a patient with adenocarcinoma metastatis to the right lobe of the liver. Note extensive replacement of the right lobe of the liver as indicated by the diminished radioactivity recorded over that area.

the colloidal particles. Unlike gold salts, the colloidal gold is chemically inert and does not produce the toxic reactions encountered with the heavy metal salt. The colloidal particles, however, are not excreted by the liver but remain indefinitely within the phagocytic Von Kupfer cells. It is therefore important to keep the dose of radiogold as low as possible in order to avoid producing radiation damage to the liver. When a dose of 300 microcuries is used in a patient with a 1,500 gram liver, 0.2 microcurie of the Au198 is delivered to each gram of liver tissue throughout the entire decay. Calculations of tissue radiation dosage based upon the formulas of Marinelli, Quimby and Hine[6] reveal that, with a

90 per cent concentration within the liver of a 300 microcurie dose of Au198, the total dose of radiation delivered to a 1,500 gram liver is less than 15.2 equivalent roentgens. The total body radiation received from an intravenous injection of 300 microcuries of radiogold is 0.3269 equivalent roentgens.

The preliminary results indicate that hepatic scintography may prove to be a valuable clinical diagnosis procedure for the detection and localization of space-occupying lesions of the liver. The test provides the clinician with an accurate means of selecting areas of the liver for needle biopsy in patients suspected of having hepatic neoplasm, cyst or abscess. The procedure is of value to the surgeon not only for diagnostic purposes, but in planning the surgical approach to such lesions. Further clinical application of this method is in progress to determine the clinical accuracy of the procedure.

Additional instrumentation changes are being undertaken in this laboratory to further increase the sensitivity and efficiency of the test. It is hoped that with these improvements it will be possible to detect the smaller lesions which cannot be visualized with the present equipment.

Summary

1. A new method for the diagnosis and localization of space-occupying lesions of the liver is described.

2. The results obtained in a series of twenty-three patients with metastatic malignant neoplasms of the liver are presented.

3. The advantages, clinical applications and limitations of the procedure are discussed.

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Discussion

Dr. Franz K. Bauer (*Los Angeles, Calif.*):—I think Dr. Stirrett and Dr. Yuhl should be congratulated on this very stimulating paper, and I would like to

straighten out a few things for you in the way of isotopes. You have probably gathered Dr. Stirrett is a surgeon and Dr. Yuhl is a neurosurgeon and I myself am an internist, which I think should make you prick up your ears as to the availability and use of radioactive isotopes in general medicine.

Isotopes have been used now for about seven years. Ever since 1946 they have been generally available for diagnostic and therapeutic applications, and it is only recently that they have been wrenched out of the hands of physicists and biochemists for diagnostic and therapeutic applications. I think that they have been oversold to the public. I think that after isotopes had become available for general use the public was led to expect that everything could be treated by means of tracers or atom particles, and I think that not enough stress has been given to diagnostic applications of these radioactive tracers. I think such a paper as you have heard should be a tremendous stimulus to all of us to try to improve our diagnostic acumen on the wards and in the office and in the search for better diagnostic accuracy so that we can guide our therapy accordingly.

There are two actual applications of tracers in this particular instance.

One is the search for an ideal substance, either a radioactive element or an element which has been tagged by means of a radioactive element such as a drug, albumin and the like which will go specifically to the cancer cell. Such a drug or such an isotope has not been found today, but there is evidence that in the preliminary work Dr. Stirrett mentioned which is also his own, whereby human serum albumin tagged with radioactive iodine, goes to neoplastic tissue in greater amounts than it will go to the surrounding normal tissue. Whether this is due to any special avidity on the part of the cancer cell or whether this substance concentrates where there is more metabolism or hyperemia or more blood flow around the cancer cell we don't know yet. This is one of the applications.

The other application which you have heard in detail is the search for a visual method whereby normal parenchyma in the liver is displaced by cancer tissue. This is a method which will give you the normal outline of a liver by means of determining the distribution of RE cells which have engorged themselves with radioactive gold. Displacement of the normal parenchyma by cancer will show up as a defect. I think this is an extremely promising method. I have seen this on the wards and I'm very enthusiastic about it. You will probably hear a lot more about it and I would like to urge you in your home cities to push this sort of approach because it has no morbidity and is quite safe. The patient has no reaction and it requires only one intravenous injection. As far as safety is concerned, you don't do this on normal controls. This is not the sort of study you'll do on medical students or volunteers. It is done on patients in whom metastases are expected where you are reasonably sure they have primary carcinoma or metastases. Therefore I think it is perfectly safe to do this procedure in these patients and deliver an amount of radiation to his liver which we consider relatively safe. It isn't something you want to do on controls, but if you

have a situation whereby other procedures with morbidity and mortality are indicated, a procedure like this is indicated when available.

I would like to mention also a few things as to this business of the mutations and genetic changes you hear about in the literature and in the press. There is evidence now that tissue, particularly thyroid tissue which has been subjected to large amounts of radiation, much larger than the dose in these procedures, will show morphologic changes. At the University of California, they took thyroid biopsies years after a patient had had a therapeutic amount of radioactive iodine. They found very characteristic cellular changes which are abnormal and were manifested by pyknosis and particular straining characteristics and looked like what some people might call premalignant. Only in the thyroid did they find that in the case of radioactive iodine. It was not found in the rest of the body. People don't have that straight. I think all of us agree that a cell in a liver which has been radiated may give rise to cells which may not be normal. We don't know about carcinogenesis. The organ which has been radiated may give rise to peculiar cells, but nothing to date has been shown on the effect to the body as a whole.

Dr. John Rupp (*Santa Barbara, Calif.*):—Since the machine seems rather involved for making a scintigram, I wondered if it was possible perhaps to use an ordinary Geiger counter and just go over the liver with that. Possibly by some audible method, getting an approximate idea of the location of some expanding lesion.

Dr. Bauer:—Yes it is. This method that Dr. Rupp suggested was done originally, Dr. Stirrett mentioned that, whereby a counter was put over the liver in a grid fashion point by point and the counts were recorded. It was a very time-consuming method, and was a method which was not as accurate as the mechanical counter because of the fact that this takes only about 25 minutes and the other procedure took a lot longer. Furthermore, I think that a mechanized instrument is preferable over a method which requires two to three people to count minute after minute over the whole body area. The principle you mentioned is essentially the same.

CLINICAL X-RAY STAFF CONFERENCES ON THE COLON*

II. Localized Constricting Lesions

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The fundamental problem in evaluating constricting lesions of the colon is that of differentiating between malignant and nonmalignant disease. X-ray investigation often permits a statement that a lesion is "undoubtedly malignant" or "undoubtedly benign". There remains a group of cases in which the x-ray appearance does not justify either of these clear-cut statements. The radiologist,

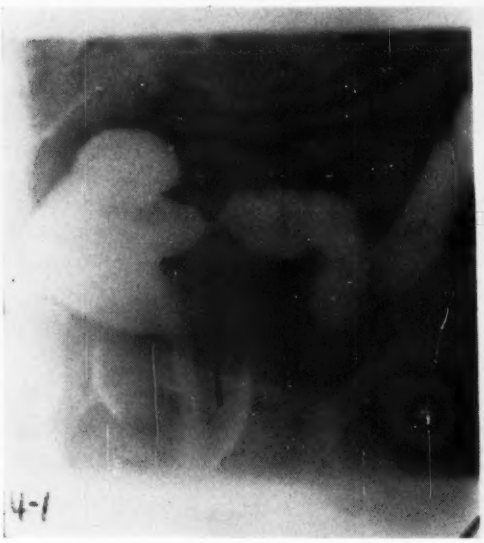

Fig. 1

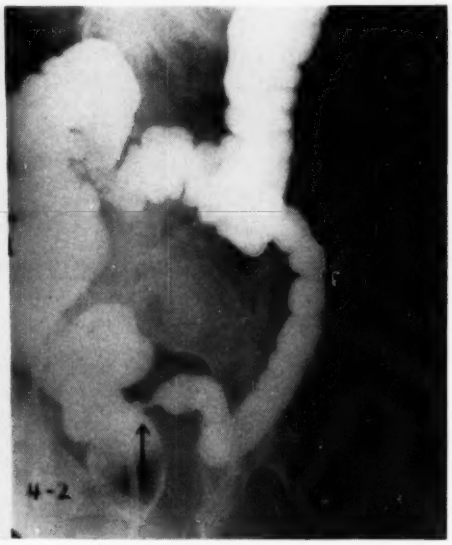

Fig. 2

Figs. 1 and 2—Case 1. Short, symmetrical constriction of the sigmoid.

stressing the most important possibility, labels this group as "possibly malignant", "probably malignant", or "probably benign but malignancy cannot be excluded". These variations of wording are used to express the degree of suspicion with which he regards the lesion. Grading of the degree of suspicion is unimportant and misleading. All of the patients in this group, regardless of the degree of

*Presented before the Eighteenth Annual Convention of the National Gastroenterological Association, Los Angeles, Calif., 12, 13, 14 October 1953.
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suspicion, must be considered as a single block and subject to the same mode of treatment. In this group the diagnosis is not completed until the lesion has been resected and examined microscopically.

The following three cases illustrate the difficulties inherent in this indeterminate group.

Case 1:—A 43-year-old woman was seen in August, 1950, complaining of alternating constipation and diarrhea, and of intermittent vaginal bleeding, with no abdominal cramping and no weight loss. Hysterectomy for removal of a fibroma had been done twelve years previously and five months previously she had received 36 hours of radium irradiation to the cervical stump.

Proctosigmoidoscopic examination did not show any abnormality up to the 24 cm. level.

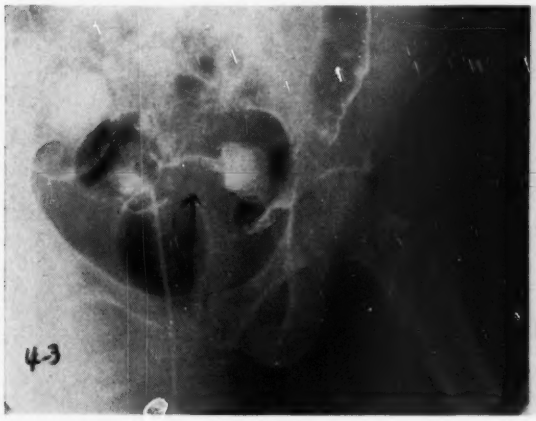

Fig. 3

Fig. 4

Fig. 3—Case 1. Double contrast film. Note abrupt change to normal caliber at each end of the lesion.

Fig. 4—Case 1. Follow-up examination three years after resection.

When the radiologist knows that the patient has had radium treatment he must be on the lookout for radiation fibrosis of the rectum or sigmoid. This is especially true when the radium therapy was done for recurrence of malignancy in a cervical stump because, in that situation, it is particularly difficult to provide the protection of adequate distance for the nearby colon and small intestine. Radiation fibrosis usually produces a very irregular area of narrowing, often tapering at the ends. It usually is long if the reaction has been produced by external radiation, but sometimes short if resulting from radium therapy, particularly if a single capsule has been used as the source of radiation.

In this case (Figs. 1 and 2) the area involved was short. It was symmetrical. In air studies (Fig. 3) it was seen to be 3 cm. long and to have an abrupt termination at each end. The radiologist considered that it was possible that the lesion might be a post-radiation fibrosis, but that the *management* of the patient must

be that of a probable carcinoma because the shape of the lesion by x-ray was more typical of carcinoma than of localized radiation effect and because diagnosis, up to this point, could not be considered completely conclusive.

Resection was done. The sigmoid colon showed a short area of marked fibrotic constriction.

The surgical specimen was a segment of colon 14 cm. long, the middle third of which contained an annular ulcer about 5 mm. wide completely encircling the organ; this ulcer had ragged margins which were fairly congested and boggy and a base of fibrous consistency. Microscopically the changes were characteristic of necrobiosis due to radiation therapy, with vascular thickening, hyalinosis and in some instances thrombosis of small arterial channels; these vascular lesions

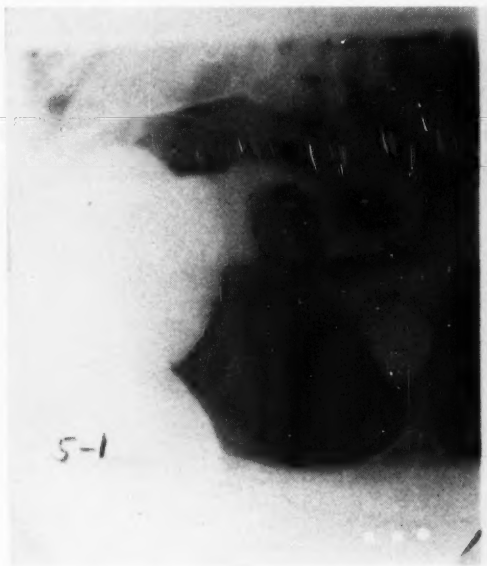

Fig. 5

Fig. 6

Fig. 5–Case 2. Spot film of filling defect in mid-sigmoid colon.
Fig. 6–Case 2. The lesion is not annular, but a broad-based intraluminal mass.

were associated with complete or partial necrosis of the surrounding tissues, including the mucous membrane as described above. There was no suggestion of neoplasm.

This was a case of postradiation fibrosis which could not be differentiated from carcinoma preoperatively. Final diagnosis depended solely on pathologic study of the involved tissue.

A follow-up film (Fig. 4), three years after surgery, demonstrates a good lumen throughout.

Case 2:–A 43-year-old woman was seen in August, 1950, complaining of abdominal pain and loss of appetite. The pains were intermittent, vague, and cramp-like in nature. There had been slight weight loss but no rectal bleeding.

The physical findings were essentially negative. Proctosigmoidoscopic examination demonstrated a normal mucosa and lumen to 22 cm. with no evidence of intrinsic abnormality.

Fluoroscopy during the injection of barium (Fig. 5) revealed a filling defect in the distal portion of the sigmoid colon. The remainder of the colon was negative. The lesion had the appearance of a broad-based intraluminal mass (Fig. 6). It was not an annular defect. It was consistent, appearing in every exposure and under every different condition of filling. The air film was not particularly helpful (Fig. 7). The postevacuation film (Fig. 8) showed that the lesion had a rather cobblestone surface.

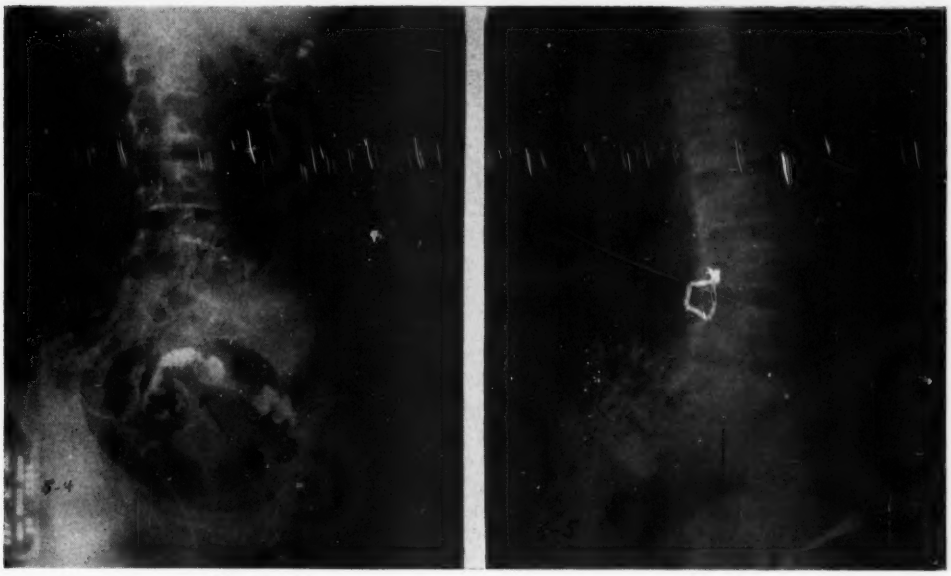

Fig. 7 Fig. 8

Fig. 7—Case 2. Double contrast film. There is no obstruction
Fig. 8—Case 2. Postevacuation film. The surface of the lesion has a cobblestone appearance.

This broad-based intraluminal filling defect had the x-ray appearance of a polypoid neoplasm and the size suggested that malignancy might well be present.

In view of the clinical diagnosis of intermittent large bowel obstruction and the x-ray evidence of polypoid neoplasm, resection of the involved bowel was done. At operation a sigmoid mass was found and removed. It had the appearance of a carcinoma. There was no evidence of local or distant spread.

The surgical specimen was a portion of colon 11 cm. long, in the wall of which were several rubbery, rather congested nodules; the largest of these measured 22 x 30 mm., and was situated just beneath the mucosa. There was considerable congestion throughout the gut wall, and some luminal narrowing, but the mucous membrane was intact and showed no sign of bleeding or other

focal lesion. These nodules were scattered not only within the muscle layers of the colon, which were considerably hypertrophied, but were also found in the subserosal and mesocolic fat. Microscopically all of these nodules had a similar appearance, consisting of typical endometrial glands and cytogenic stroma; some of them showed evidence of old or recent bleeding into the gland lumina, but there was no suggestion of malignant change.

Here again is a preoperative diagnosis which differed importantly from the final diagnosis. The correct diagnosis could not have been made except by tissue

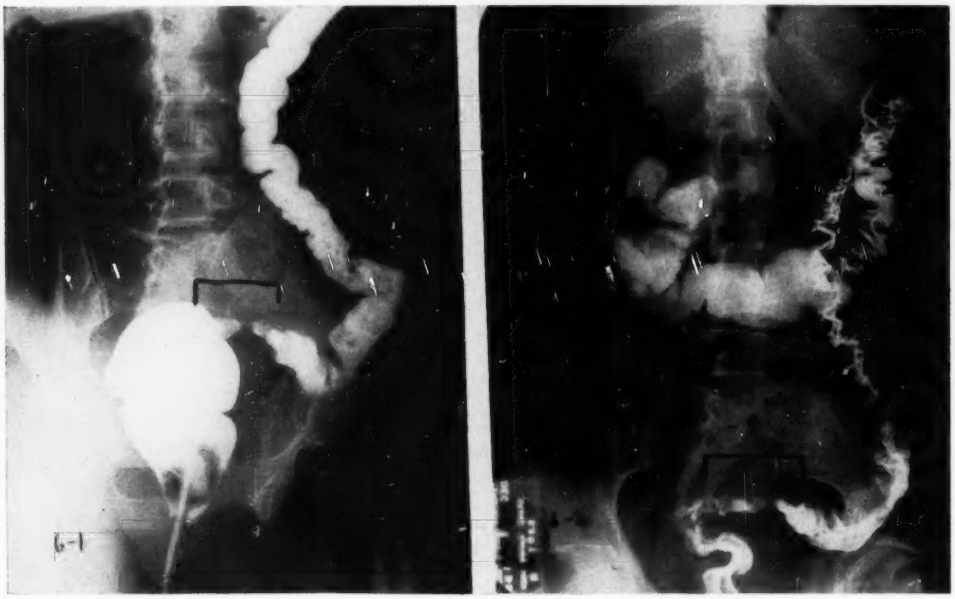

Fig. 9 Fig. 10

Fig. 9—Case 3. Long, tapering constriction of the sigmoid colon.
Fig. 10—Case 3. Postevacuation film.

examination. In this case the radiologist believed the mass was an intrinsic colon neoplasm and the surgeon thought that he was dealing with a carcinoma even during operation. Review of the menstrual history with the patient, after the true diagnosis had been determined, did not reveal any history of menstrual abnormality. The episodes of abdominal pain were definitely not associated with the menstrual cycle.

Case 3:—A 43-year-old woman was seen December, 1952, complaining of cramping in the lower abdomen for four months. This cramping had become increasingly severe. On two occasions there had been bleeding from the rectum at the time of bowel movement. There was tenesmus and some nausea. There had been a five pound weight loss.

Abdominal examination was negative and proctosigmoidoscopy showed no intraluminal lesion to 24 cm. The sigmoid, however, did not have normal mobility.

This suggested extrinsic fixation by a mass in the pelvis. We suspected diverticulitis.

Fluoroscopy demonstrated marked narrowing and irregularity of a long segment of sigmoid colon (Figs. 9 and 10). Considerable fecal material remained proximal to it, in spite of the extensive preparation. This fecal residue served as a further indication of the degree of the obstruction. The length of the lesion, the absence of any abrupt termination, and the lack of irregularity of its channel gave this lesion the appearance of an inflammatory process or of narrowing due to pericolic scarring. It was not the appearance of neoplasm. No definite diverticula were seen and it did not look like diverticulitis.

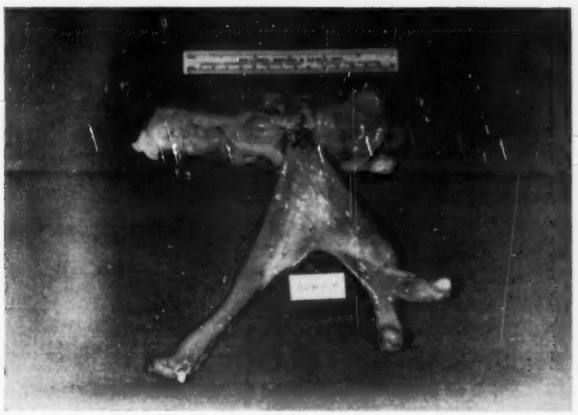

Fig. 11

Fig. 11—Case 3. Surgical specimen. A tiny annular carcinoma of the sigmoid is responsible for the short constriction seen in radiographs, while the long tapering constriction on either side is produced by adhesion of small bowel to the sigmoid colon.

Conclusions were: "Definite organic pathology in the sigmoid colon involving an area approximately seven centimeters in length. The findings are more characteristic of an inflammatory process or scar formation than of neoplasm, although the latter cannot be definitely excluded".

Assuming temporarily that the mass was inflammatory in nature, intensive medical treatment was employed for six days, which consisted of hypertonic return irrigations of the rectum and the use of broad spectrum antibiotics by mouth. A satisfactory clinical response did not occur and segmental resection of the involved bowel was therefore done. The gross appearance of the mass at operation was that of a small, firm, stenosing lesion to which the ileum was closely adherent. The attached segments of colon and small bowel were resected en bloc.

The surgical specimen (Fig. 11), was a portion of colon 20 cm. long, the middle third of which included a typical napkin-ring adenocarcinoma which had narrowed the lumen considerably due to mural thickening with some ulceration of the mucosa; the proximal gut was markedly dilated, while distal to the

lesion the caliber was normal. There was considerable congestion and induration of the fat tissue about the lesion, and a loop of small bowel was firmly plastered to the serosal aspect of the colon at this point, but no extension of tumor into the small bowel wall could be demonstrated. An interesting incidental finding was a typical Meckel's diverticulum, 5 cm. long, projecting at right angles from the segment of small bowel near one end thereof. Microscopically the tumor was a typical adenocarcinoma which penetrated to the subserosa, accompanied by a good deal of purulent inflammation, but without demonstrable extension to the regional lymph nodes nor into the wall of the adherent small bowel.

The short area of nearly complete obstruction in the roentgenogram corresponded to the very small malignancy which was present. The much larger deformity which dominated the radiologic picture and which had the appearance of pericolic adhesions actually was produced by the area of adhesion of small bowel to colon. This is a case in which the radiologist correctly interpreted what he saw, but what he saw was not the thing which was vital to the patient.

Discussion

The foregoing three cases, all localized constricting lesions of the colon, only one of which was a carcinoma, illustrate the truism that only microscopic diagnosis is definitive. Carcinoma will be missed unless the group of cases submitted to resection is broad enough to include all suspicious cases. It is inevitable that such a group will also include some benign lesions.

RADIOLOGICAL STUDY OF THE SMALL BOWEL*

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Examination of the gastrointestinal tract by means of x-rays was undertaken within a few months of Roentgen's first announcement of his discovery and, in the succeeding fifty-odd years, countless thousands of such examinations have been made. The vast majority of them, however, have been limited to the stomach and the first portion of the duodenum, and to the colon. Since life can be quite well maintained without a stomach or without a colon and since survival is impossible after removal of any large section of small bowel, it seems strange that the enormously important small intestine has been subjected to x-ray examination with such relative rarity.

The explanation of this neglect is quite rational; there are two rather sound reasons for it. First, it is only within fairly recent years that the physiological importance of the small bowel has been so well understood. Second: it was necessary to wait for development of the technical means of conducting such a study.

In this discussion I shall omit the first portion of the duodenum since it is commonly studied with the stomach, and shall confine myself to the small intestine from the second portion of the duodenum to the ileocecal valve. Furthermore, I shall omit the surgical conditions of adynamic and mechanical ileus, volvulus and intussusception.

Generally speaking, the indications for radiological study of the small bowel are: diarrhea, bleeding, and abdominal pain. It is assumed that disease of the stomach, the first portion of the duodenum and the colon have been excluded.

The technic employed varies with different examiners and, undoubtedly, there are various technics which are equally satisfactory. The important thing is to have a standard technic and to adhere to it, basing one's opinions on known standards. A satisfactory method is to administer to the fasting patient four ounces of pure barium sulfate in five ounces of 0.9 per cent salt solution. The use of physiological salt solution relieves the gastrointestinal tract of the task of converting a hypotonic solution (or suspension) to one that is isotonic. The stomach and first portion of the duodenum can be examined during and after the ingestion of the opaque material and the usual films can be made. Thereafter, observations are made at intervals determined by the progress of the meal. These are usually intervals of thirty minutes, but the periods may vary. The objective is, of course, the visualization of the entire small bowel. Fluoroscopic observations and spot films should be made during the course of the examination, which is continued

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until barium has entered the cecum. It should be emphasized that a good small intestine study must fit the problem at hand and must be more or less improvised as it progresses.

The small intestine may be considered as approximately normal when the transit time of the barium mixture is neither unduly long nor short; when the caliber of its lumen conforms to the average, and when the expected mucosal relief pattern (i.e., the contour of the luminal surface) is present. The average transit time is between two and four hours, with three hours representing a fair average. The opaque column should be continuous rather than broken up into separated boluses. The transit time may be shortened by permitting the ingestion of food and a very rapid survey may be conducted by icing the barium suspension. The lumen of the small bowel is rather uniform with the jejunum a little larger than the ileum. The mucosal relief pattern of the jejunum differs from that of the ileum. In the jejunum the folds, or valvulae conniventes, are fairly high, are one to two millimeters wide and are from one to three millimeters apart. They cannot be obliterated by pressure, and even in the widely distended loops seen in obstruction, the folds are still visible. The mucosal folds of the ileum are much flatter and are farther apart. They can be obliterated by pressure and, in the terminal ileum, they are sometimes undemonstrable.

Inflammatory disease of the small intestine may be acute or chronic. Since the acute processes are usually quite recognizable clinically, and since their clinical course is almost invariably rapid, progressing quickly to recovery or death, there has been almost no opportunity to study them radiologically and our knowledge of them is slight. The chronic inflammatory lesions may be grouped as tuberculous and nontuberculous.

There appear to be two types of nontuberculous inflammatory disease of the small intestine: sclerosing enteritis, or Crohn's disease, and nonsclerosing ileitis. The term "regional ileitis" which is quite loosely used should, I believe, be reserved for the nonsclerosing lesion, which actually affects only the terminal ileum. It is true that sclerosing enteritis is most common in the ileum, but it should not be forgotten that any part of the small intestine may be involved.

Nonsclerosing ileitis is, in all likelihood, a psychosomatic disease, differing from Crohn's disease in having no sclerotic component. We have seen only a very few instances of this disease and these were rarely proved. According to Golden it chiefly affects young women and presents itself clinically as right lower quadrant pain suggesting appendicitis. Occasionally, but rarely, diarrhea is a sign. On x-ray examination there is found no narrowing of the lumen of the ileum, but changes in the appearance of the mucosa are seen. The changes are demonstrable, as a rule, only in films made with pressure over the involved area. They consist essentially of a polypoid appearance which Golden has likened to cobblestone pavement. Sometimes the wall of the ileum is sufficiently thickened to render it palpable. It is usually tender. The condition subsides under medical

treatment including rest and a low residue diet. Surgical treatment is not indicated.

True sclerosing regional enteritis is usually manifested by attacks of cramping pain associated with diarrhea and fever. Frequently, a sausage-shaped mass may be palpated. Pathologically, the disease consists of a sclerosing inflammatory process involving all layers of the intestinal wall, with irregular narrowing of the lumen. Ulceration may be present; fistulae sometimes occur. The most common site is the terminal ileum, but any part of the small bowel may be involved. The area of involvement is usually short and well demarcated but multiple areas of disease may be present. The roentgenological findings consist of narrowing of the lumen, absence of mucosal folds, and with a tender mass corresponding to the location of the narrowing. The treatment is largely surgical.

Tuberculous inflammatory disease of the small intestine is by no means uncommon. Although commonly associated with the adult type of pulmonary tuberculosis it may occur without any demonstrable lung lesion probably as a secondary infection from a primary focus not recognizable. The common form is the ulcerative lesion and the chief roentgen finding is extreme hyper-irritability. It occurs most frequently in the terminal ileum and involves the cecum. Inability to fill the cecum and the last inches of ileum with barium is a characteristic finding. Although the disease may involve the jejunum it is rare to find it elsewhere than in the terminal ileum. The hyperplastic form, with granuloma formation is rare and cannot be differentiated from any other process which might produce scarring and narrowing.

Differential diagnosis between nontuberculous and tuberculous inflammatory disease is difficult and, in fact, is often impossible. The presence of known pulmonary tuberculosis is a presumption in favor of intestinal tuberculosis. Other factors are the ileocecal location of the lesion, and marked hypermotility and hyperirritability; findings which favor a diagnosis of tuberculosis. Sometimes one must be content to recognize only an inflammatory sclerosing lesion and wait for the histopathological studies to make the differentiation.

Both benign and malignant neoplasms occur in the small intestines, although they are not very common. Benign lesions include fibroma, myoma, lipoma, adenoma, endometrioma, angioma and polyps. Endometriomata are fairly common but since they commonly are found on the serosal aspect of the bowel, they are not very often recognized. A benign tumor may function as the motor mechanism for the production of intussusception but, usually, only the obstructive mechanism is recognized and the tumor is found only at surgery. Unless the neoplasm produces obstruction, one would be able to recognize it only by the presence of a filling defect in the barium filled segment. Golden says that he has never been able to demonstrate a tumor in this way, but we have seen one instance of a filling defect in the ileum which was recognized as a probably benign tumor and which, on exploration, proved to be a lipoma. The patient's symptoms were those of transient but recurring intestinal obstruction.

Malignant tumors of the small bowel are not common, or, at least they are not commonly recognized. Carcinoma, lymphosarcoma, and metastasizing carcinoids are the tumors most frequently encountered although plasmocytoma and leiomyosarcoma have been reported. They may produce obstruction by obliterating the intestinal lumen or by acting as the motor mechanism in the production of intussusception. When they do so, they are usually first recognized when surgery is undertaken for the relief of the acute obstructive symptoms. If they do not produce obstruction the symptoms are likely to be rather vague and to consist of abdominal distress and weakness which results from anemia. Gross or occult bleeding may occur intermittently. This detection by x-ray examination depends upon the recognition of filling defects with obliteration of the mucosal folds. Occasionally a fistulous tract connecting with the colon may be demonstrated. The characteristic defect is short, while that of inflammatory disease is quite long. Any portion of the small bowel may be involved. Carcinoma of the duodenum is generally believed to be a very rare lesion but we have encountered four cases of it in the past two years. All were characterized by destruction of the mucosal folds and narrowing of the lumen producing a pronounced filling defect. The changes in malignancy of the jejunum or ileum are practically identical. Differentiation from inflammatory disease is extremely difficult and rests mainly on the length of the defect. Frequently differentiation is impossible.

Having thus rather summarily disposed of the more common organic diseases of the small intestine, let us turn our attention to a group of entities which are much more common and which are commonly ignored. These include the disorders of nutrition, allergic phenomena, and the effects of emotion.

The nutritional disorders include varying degrees of starvation, disturbed digestive processes and incomplete absorption or utilization of foods.

Generally, they may be considered as forms of avitaminosis with the Vitamin B group as the most important. The symptoms include vomiting, abdominal distress, diarrhea, loss of weight and anemia. They may be secondary to biliary tract disease or to organic disease of the gastrointestinal tract, but frequently they represent a primary physiological disturbance initiated by ill advised attempts at weight reduction; by bizarre theories about foodstuffs, by the pernicious vomiting of pregnancy or by alcoholism. Hypoproteinemia and hypocalcemia are also factors to be considered.

The roentgen findings may be divided into two groups: changes in motility and changes in the intestinal mucosa. In the earlier stage of nutritional deficiency hypermotility and hypertonicity are the rule. The transit time of the opaque meal is greatly reduced, with barium entering the cecum within thirty minutes after its ingestion, and sometimes having reached the rectal ampulla within forty-five minutes. The lumen of the bowel is narrowed throughout, sometimes to less than half of its normal caliber. In the more advanced stages, the transit time may be markedly prolonged, even to seven or eight hours. With this alteration in

motility is commonly seen considerable dilatation of the intestine. Local areas of spasm produce segmentation of the bowel and, as the main mass of opaque material progresses, irregular masses may linger behind.

The changes in the mucosa consist of flattening and even obliteration of the folds so that in advanced cases the intestine resembles a thin rubber drain filled with barium. Following appropriate treatment the reestablishment of normal motility and the re-appearance of normal mucosal folds offer quite convincing evidence of the nature of the disease process.

We know but little about gastrointestinal allergy, but undoubtedly it does exist. The detection of allergic manifestations is extremely difficult and one must have some clue to follow if such a condition is to be recognized. The roentgen findings are quite variable and can be definitely interpreted as representing an allergic response only when they occur, or are strikingly accentuated, when the suspected food is added to (or given in conjunction with) the usual allergen-free barium suspension. They consist, in general, in marked alteration in the motility of the gastrointestinal tract, with narrowing and segmentation of the small bowel through which the barium is scattered in an irregular and disconnected manner, producing a picture strikingly unlike that of the normal barium filled small intestine. A rather large gastric retention is a frequent finding; in one instance we observed almost no emptying of the stomach four hours after the ingestion of the opaque medium.

The following cases are of interest because of the striking changes provoked by the allergen-bearing food, which was milk, and the prompt relief which was obtained following avoidance of the allergen in the first case.

Case 1:—A white female, age 29, had no significant history except for rather long standing abdominal pain. About ten years previously she began to have what she described as a "generalized stomachache". After enduring this for three years, she had her appendix removed. There is no record of examination of the appendix by a pathologist, but the patient's symptoms were not relieved. For the ensuing four years, however, she was not very uncomfortable and received no medical treatment. About two years before the present study, she began to experience cramping epigastric pain with marked tenderness and vomiting. She was hospitalized and subjected to gastric analysis and to x-ray studies of the gallbladder and gastrointestinal tract. The gastric acidity was normal, and the x-ray findings were not significant. The patient was nevertheless put on an ulcer regime and was given antispasmodics. She felt fairly well for a time, but alternating periods of diarrhea and constipation presently developed, with recurrent attacks of abdominal pain. The pain occurred one and one-half hours to two hours after meals, and was said to be most severe after breakfast.

By this time the patient had discovered that there were three things which increased the severity of the pain: ice cream, milk and whiskey. With this clue in mind, she was given an allergen-free suspension of barium sulfate in normal

salt solution and a small bowel study was carried out. The intestinal pattern was definitely abnormal, perhaps because the responsible allergens had been regularly in her diet. Four days later the examination was repeated and, on that occasion, some milk was added to the opaque medium without the patient's knowledge. Comparison of the two studies showed very striking differences and it was concluded that the symptoms were due to allergens in milk. The patient was given some crude liver extract intramuscularly and some yeast by mouth, and was instructed to boil all milk for ten minutes. Her symptoms disappeared and have recurred only once in the past three years; on that occasion she had eaten some ice cream.

Shortly after the experience just related another patient with a similar but much more severe syndrome was seen. There was no particular reason to suspect an allergic reaction, and the study was suggested almost entirely by our keen interest in the similar problem which we believed we had just solved.

Case 2:—A white female, aged 44, gave a long history, extending over twenty years or more, of severe abdominal pain and vomiting. Several exploratory abdominal operations had been performed, but no definite lesion was ever found. The patient was somewhat confused, and a clearly defined history was not obtained. Certainly she had had much pain over a long period. The gastrointestinal tract was studied with the usual suspension of barium sulfate in normal salt solution and, a few days later, was re-examined with the addition of some milk to the medium. Although the small bowel was far from normal at the first examination, the addition of milk produced remarkable alterations in both the appearance and the behavior of the intestine.

It was impossible to alter the patient's dietary habits, and the findings remain inconclusive, but her symptoms and the x-ray manifestations so closely resemble those of the previous case that it seems likely that they are also of an allergic nature.

The effect of the emotions on the gastrointestinal tract is extraordinarily well known in folk lore and in literature, and has been recognized over thousands of years, and throughout the entire world. Nevertheless, we physicians pay but little attention to it when confronted with a gastrointestinal symptom-complex, failing to note that unhappiness, fear, and other emotional disturbances have a strong tendency to manifest themselves as vomiting, diarrhea, and abdominal distress. These are, of course, common complaints and they may arise from such diverse causes as the ingestion of some noxious substance or to a malignant tumor. In general, we need not be too concerned with the plain hangover, or acute food poisoning; the mechanism here is usually quite obvious, and the syndrome is of short duration and self-limited. Vomiting due to pyloric obstruction and the pain and vomiting of intestinal obstruction offer no great problem. Other objective findings and the history will usually afford a clue sufficient for solution of the problem. I do not pretend to have disposed of the organic causes of

vomiting, pain, and diarrhea; I mention only these two simple examples to indicate that, ordinarily, there should be no great difficulty in the recognition of actual organic causes for these symptoms.

But not infrequently we are faced with a diagnostic problem of a quite different nature, as, for example, that of a patient who has been vomiting for two or three years with no weight loss and with no very appreciable change in health; or a patient with a long history of abdominal pain and diarrhea, unaccompanied by much perceptible harm. If one asks oneself what organic disease produces vomiting or diarrhea and abdominal pain, continuing several years with little change in the general status of the patient, one will find it difficult to answer. Yet such cases are not infrequently encountered and are tagged with such labels as "spastic colitis", "duodenal stasis", and the like.

With these few observations, I should like to present a case of profound emotional conflict which actually was deduced from examination of the gastrointestinal tract.

Case 3:—A white woman, 54 years old—and it is essential to her history that she is Jewish—entered the hospital for diagnostic study, complaining of vomiting, abdominal pain, and diarrhea extending over a period of twenty-two years. During this time she had undergone fifteen abdominal operations, with no relief of symptoms. Her past history otherwise seemed of little significance. She did not appear to be acutely ill. She had not suffered any appreciable loss of weight over the past few years. Except for heavy scarring of the abdominal wall, there were no physical findings of importance. General nutrition was reasonably good.

Shortly after admission a gastrointestinal x-ray investigation, including survey films of the small intestine, was made. The opaque medium employed was an allergen-free suspension of barium sulfate in normal salt solution. No organic lesion was observed and the pattern and behavior of the intestinal tract were not remarkable. During this study, the examiner talked freely with the patient and was rather astonished when she told him that she knew what her trouble was but that no one would listen to her. Assured that he would listen, she said flatly that she was allergic, and that the substance to which she was allergic was pork.

This seemed to be a significant statement. Jewish dietary laws are extremely complicated and involve a great deal more than simply not eating pork. I believe it a fair statement, nevertheless, that pork is a sort of prime symbol, and that many quite devout Jews overlook some of the minutiae of the law and would still refuse to eat pork. With this in mind, the possibility occurred to us that this woman, an educated and cultured person who believed herself to be an agnostic, and who paid no regard to the dietary laws of her religion, was suffering from an unconscious conflict which, when she ate pork, manifested itself as an emo-

tional storm passing over the sympathetic chain, producing a marked and dramatic effect in the gastrointestinal system.

The patient was told that it would be necessary to repeat the gastrointestinal study and on the second occasion she was given a different opaque medium. The bone was removed from a pork chop and the meat was carefully stripped of all fat and thoroughly cooked in a pressure cooker. It was then ground very finely and, with a high-speed blender, was mixed with barium sulfate and normal salt solution. The patient was quite unaware of any difference between this mixture and the opaque medium employed in the first examination, and took it without comment. The findings were identical with those previously observed and were believed to be of no significance.

The fact that the patient had ingested a considerable amount of pork with no evidence of any reaction, and with no change in the behavior of the gastrointestinal tract, was thought to eliminate this as a possible source of allergens.

No difficulty was experienced in persuading the patient to submit to a third examination, and this was carried out with the opaque medium employed for the first study, i.e., barium sulfate in normal salt solution. Immediately after the suspension had been taken, she was offered a small slice of well done roast pork, from which all fat had been removed. Within thirty minutes after eating the meat she experienced violent abdominal pain and a film of the abdomen showed a striking change in the pattern of the small bowel.

In conclusion, may I say that my intention has been to direct attention to the nonorganic conditions that affect the small bowel and that if I have interested someone in these common but frequently ignored complexes, I have achieved my purpose.

President's Message

The American College of Gastroenterology comes into existence because there is a need for it.

Any physician who has the desire to advance gastroenterology—to improve diagnosis and treatment of gastrointestinal disorders will find a place in the college.

Those who wish to devote all their efforts to the field of gastroenterology and who have had the required training and preparation may qualify as Fellows.

Others who are looking forward to specializing in gastroenterology and desire to qualify may apply as Associate Fellows.

A physician or surgeon who is especially interested in gastroenterology, but does not intend to limit himself exclusively to this field may obtain membership privileges in the college, and thereby lend his support and interest to advancing the study and research of gastrointestinl diseases.

The American College of Gastroenterology is a democratic organization dedicated to the highest ideals of medicine, and determined to render a service to all its members as well as to the patients they treat. It hopes to merit the support and active cooperation of any and all physicians, surgeons, and allied specialists who have the welfare of gastroenterology at heart.

It aims to secure the help and cooperation of teachers of gastroenterology in our medical schools, and to encourage hospitals to establish departments of gastroenterology.

The program advocated and the means of achieving its aims will be given the widest possible publicity, so that everyone interested may know what the college stands for and how it expects to function.

These are the principles and ideals which have motivated the organizers. As soon as all the necessary steps have been taken the college will embark on its course and it is sincerely hoped that the reception accorded the new college will be well merited.

Sigurd W. Johnson

ABSTRACTS FOR GASTROENTEROLOGISTS

GASTROINTESTINAL TRACT

FOOD POISONING: K. F. Meyer. New England J. Med. 249: Nos. 19, 20 and 21, (Nov. 5, 12, 19), 1953.

This extremely informative and comprehensive review of a subject so frequently misnamed cannot by any stretch of the mind be abstracted in any journal. It must be reviewed as a monograph; for such it is. The completeness of the subject matter with the clarity of its presentation makes this series of articles an outstanding contribution to medical literature. Nowhere in the past could one find the subject of "food poisoning" discussed in such clarity and completeness. As Dr. Meyer states, "In the broadest sense, food poisoning includes all illnesses arising from the ingestion of food,—". Such illnesses are classified and discussed in as concise and complete a fashion as any physician could wish.

WILLIAM E. JONES

ON THE DIAGNOSIS OF MALIGNANT LYMPHOMA OF THE GASTROINTESTINAL TRACT: E. L. Lame, C. A. Velat and R. P. Custer. Ann. Int. Med., 40:57-74, (Jan.), 1954.

Malignant lymphomas of the gastrointestinal tract during a five year period at the Presbyterian Hospital in Philadelphia comprised 20 per cent of malignant tumors of the stomach found at operation, half of those removed from the small intestine but only a very small percentage of tumors of the large bowel. Preoperative diagnosis of gastrointestinal lymphoma is difficult and requires correlation of clinical, radiologic and laboratory data in a given case. The combination of epigastric pain, anorexia, nausea and vomiting without signs of obstruction, slight weight loss or anemia, a palpable mass and roentgen evidence of a large tumor of the stomach should lead to strong suspicion of gastric lymphoma. Roentgen study alone is usuccessful in the diagnosis, for films from cases of lymphoma, carcinoma and chronic gastritis may be very similar.

The gross operative diagnosis is unreliable. The surgeon should remove a portion of the main mass for pathologic study and not be content with biopsy of neighboring lymph nodes. Large unresectable tumors of the stomach or intestine may not be carcinoma but may prove to be a lymphoma and responsive to irradiation.

ARNOLD STANTON

ESOPHAGUS

DYSPHAGIA DUE TO A DIAPHRAGM-LIKE NARROWING IN THE LOWER ESOPHAGUS ("lower esophageal ring"): R. Schatski and J. E. Gary. Am. J. Roentgenol. pp. 911-922, (Dec.), 1953.

The authors describe dysphagia caused by smooth, symmetrical, diaphragm-like narrowing in the lower end of the esophagus in five adult males. It was found that the greatest diameter and the position of this ring are constant in a given person with this exception that it can be stretched by the passage of solid or semi-solid food

through it. It was found that the constancy of the diameter of that ring could be best tested with barium filled gelatin capsules. The nature of this ring is as yet unknown. It was found that education in eating habits relieved most of the cases; only an occasional case requiring surgery.

J. R. VAN DYNE

STOMACH

CARBONATED SOFT DRINKS IN ROENTGEN DIAGNOSIS OF FOREIGN BODIES IN THE STOMACH: W. Roberts. Am. J. Roentgenol, pp. 239-242, (Feb), 1954.

The author uses carbonated soft drinks as a contrast medium in the roentgen localization of radiographic foreign bodies in the viscera cavity. It is important that the drinks be cool and used in small quantity. Large amounts frequently give false impressions. The authors point out the value of the method. Its value is least after heavy meals and is particularly valuable in children who will not take barium but will readily accept carbonated drinks. The procedure is simple, fast, reliable, and may give localization where more complicated and time consuming methods fail. The authors x-rays are convincing.

J. R. VAN DYNE

THE ROLE OF NERVOUS FACTORS IN THE CAUSATION OF PEPTIC ULCERATION: Bruce Robinson, M. J. Australia, 1:624, (May), 1953.

Dr. Robinson states that peptic ulceration represents the resultant of many forces rather than having a single etiological cause. He considers the most significant of these forces: "presence" of hydrochloric acid and pepsin, "nervous" factors, and trauma. Ulcers occur, he states, in those with a personality profile which includes hyper-response to emotional stress. The pathway in which emotional factors affect abdominal visceral responses is through corticular stimuli to the hypothalmus, thence to the autonomic nerves ending in the stomach. These give rise to exaggeration of physiological responses in the viscus, resulting in morbid anatomical changes. Thus, he considers the emotional conflict which generates such a reflex as the primary cause, the disturbed soma, as secondary.

The author painstakingly traces all the various neuroanatomy associated with this etiological factor. Functional gastric disturbances may result from sympathetic or parasympathetic malfunction and both systems are responsive to emotional stimuli. He feels that specific personality patterns are of less importance than typical conflict situations. He found this specific conflict to consist of pride and striving for independence with accomplishment and self-sufficiency opposed by unconscious wishes to remain dependent and to receive, in an infantile sense. This causes, under the impact of stress, a regression to the oral-receptive psychosexual stage. Because many peptic ulcer patients are outwardly aggressive, ambitious and independent they are forced to keep the dependency wishes in repression. Food becomes a symbol of love; but the stomach responds to the infantile demand for love, in the form of food, by being in a chronic state of hypermotility, hypersecretion, and hyperemia. The differentiation between the psychic component of gastric and duodenal ulcer cases is the latter experiences anxiety over work. He concludes that psychotherapy is a most useful preventive measure and is an *essential* part of established ulcer therapy.

REGINALD B. WEILER

HEMORRHAGE FROM STRESS ULCER TREATED BY RESECTION: Robert G. Salasin and Warner F. Bowers. Surgery, 34:821-825, 1953.

Operations, burns and other strains may cause ulceration of the upper gastrointestinal tract. Although gastric reaction to stress is partly mediated through the vagus nerve, Selye's hormonal adaptation syndrome is also involved. The stimulus passes from hypothalmus, to pituitary, to adrenal cortex, and then to the stomach. Gastric or duodenal lesions may result from: ACTH or cortisone therapy, traumata, infection, fatigue, emotional tension, and terminal illnesses, especially if there has been shock. Acute ulcers are not easily visualized by radiography, and symptoms may be overlooked.

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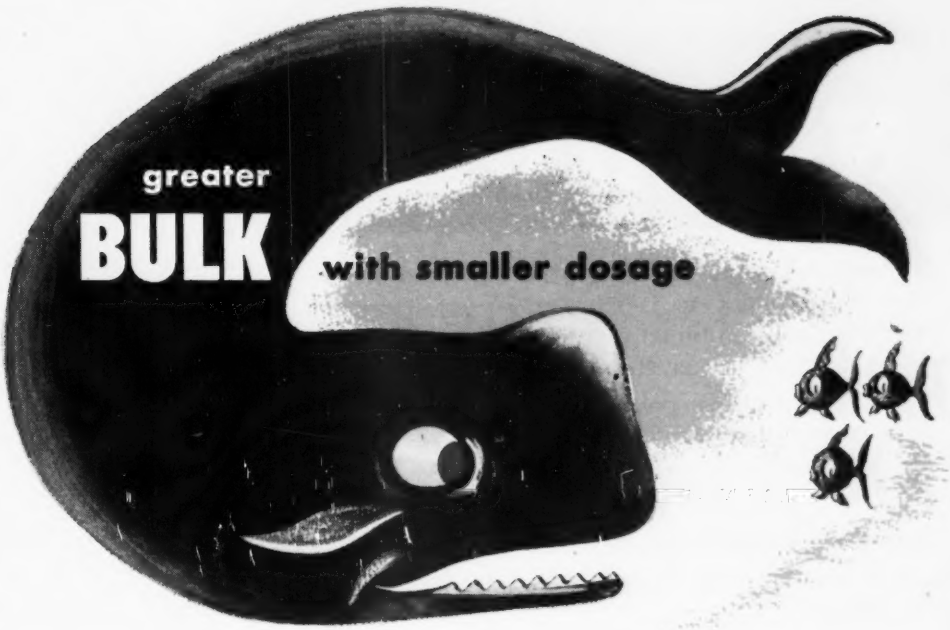

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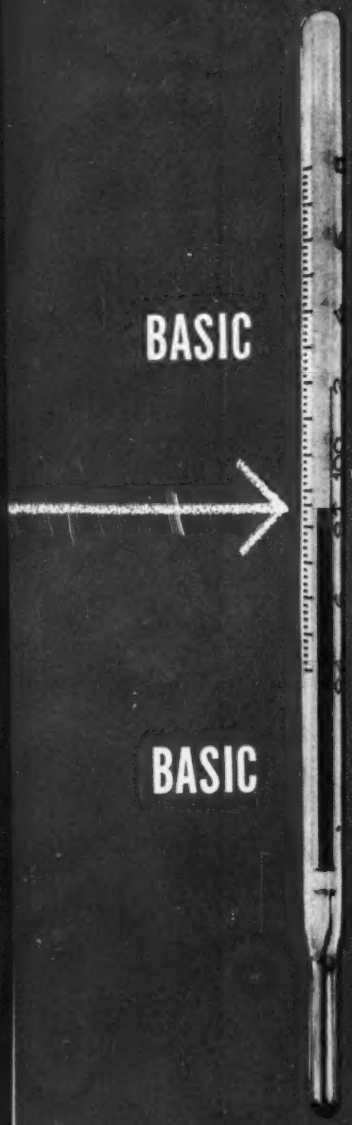

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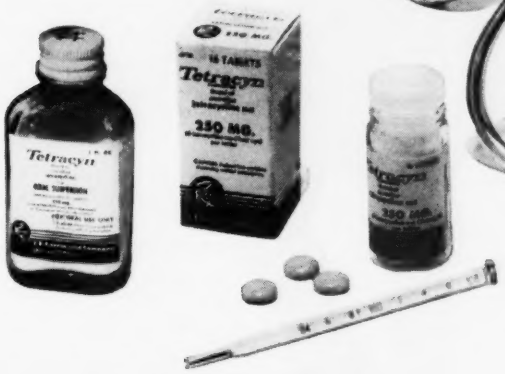

*English, A. R., et al.: Antibiotics Annual (1953-1954), New York, Medical Encyclopedia, Inc., 1953, p. 70.

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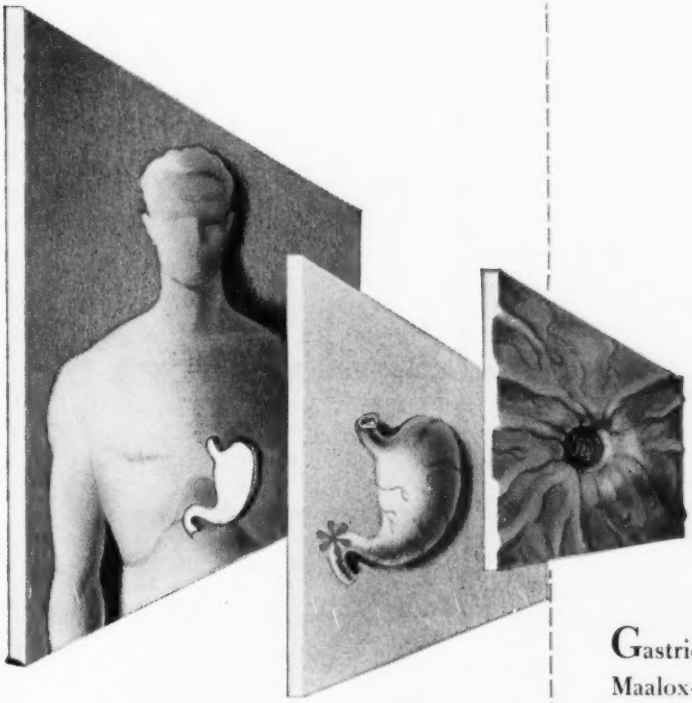

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